ELECTRICAL REVIEW

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The Institution

Its Diverse Activities

EACH year at the end of May come the nominations for the next session's Council of the Institution of Electrical Engineers to give, perhaps, a superficial impression that activities are suspended for the summer. Although that may be true as regards the general body of members, it is by no means the case with those who hold office of one kind or another. Their duties go much further than arranging for papers and discussions to meet the needs of widely differing technical interests, and qualifications for election are correspondingly exacting and various.

The War and After

At the present time two broad aspects call for continuous attention. The first relates to the prosecution of the war and the second (where it is of immediate import) to war's aftermath. In both the task of the Institution is to present the electrical engineering standpoint, not in any narrow professional sense but with the aim of ensuring that its members are allowed to give all that is in them to advancing the national purpose.

There can be no doubt of the inestimable value of the expert advice given to the Government in the placing of electrical engineers so that their skill and experience may be most effectually engaged, whether in uniform or out, and, through its training schemes, in providing against a risk of shortage of technical men. Again, the restricted sources of basic materials has involved considerable thought in finding alternatives and in departing from well-established methods.

No doubt the adaptability of outlook thus engendered will be most useful in meeting post-war conditions when a greatly increased demand for electrical services will have to be met in the face of continuing difficulties in obtaining essential materials. Contacts with Government Departments will then be largely in connection with housing and reconstruction, but the forthcoming Report on Electrical Research may be expected to entail important negotiations with official bodies. Also the provision of the new Education Bill will have to be considered in the light of the recent I.E.E. Report on the Education and Training of Engineers.

Active Local Centres

Liaison with kindred associations so that the place of engineering and science in the community may be made known to the public is another function of the Council. Related to this is the close touch that is being maintained with electrical engineers of allied nations now in this country, which should be of mutual benefit hereafter. These few instances of work at the head, though focusing the aspirations of ordinary members, would not of themselves be enough to ensure a healthy organism. The virility of the Institution is shown also in the activity displayed by its Local Centres and Sub-Centres. For example, the formation of a Wireless Group by the North-West Midland Centre promises well for a new

tendency to parallel the four very successful specialist sections in London.

Recognition by electrical engineers themselves of the part being played by the Institution is reflected in an increasing number of applications for membership, which for the past year eclipsed previous records. Equally to the point is it that there were three times the usual number of transfers to full membership—an indication of a wider appreciation that the governing body of the Institution should be based upon as broad a foundation as its Charter permits.

Codes of Practice

PRESUMABLY the sub-committee to be convened by the I.E.E. to deal with Codes of Practice for Electrical Installations will be much the same as the I.E.E. Committee responsible for the present Wiring Regulations. The latter themselves provide admirably for good practice. Like the other Codes recommended by the Ministry of Works (which form the subject of a foreword in the *I.E.E. Journal* for May) they are not mandatory, since they do much more than prescribe minimum safety requirements. Any rules that it may be considered should be made compulsory for saftey reasons should be the work of a separate committee initiated by the Institution.

Continued Economy Needed

THE Select Committee on National Expenditure appears to embrace everything within its scope. It has just produced a report on coal in which the public is warned of the difficulties which will be encountered next winter. The Committee agrees that the voluntary fuel economy campaign has proved successful, but stresses the need for continued endeavour. It recommends that where choice is possible gas should be used rather than electricity on account of the vital by-products from gas manufacture. But there is of course a case for the use of electricity too in given circumstances.

Battery Transport

THE one-ton electric vehicle described in this issue represents the first fruits of collaboration between manufacturers with a view to developing a type that would compete in cost with other well-established forms of transport. This heavy-duty model is an advance on the 10- to 12-cwt. light delivery vans formerly considered as most suitable for electrification. The interchangeability of the batteries should greatly encourage the setting up of roadside battery-charging stations which are often advocated in order to increase the operating radius of electrically propelled vehicles.

The End in View

How to squeeze instruction in engineering economics into an already congested college curriculum appears to many as a problem that presents the greatest obstacle to the full acceptance of Sir Frank Gill's views on the subject. In this issue Professor R. O. Kapp discusses the method he has adopted of making the most of his time, in the light of many years' experience of the more practical aspects of engineering and students' needs in this respect. The essential aim is not to turn out men with an advanced knowledge of cost accountancy, but to inculcate in students a realistic attitude towards their future work and to demonstrate the main principles that will enable them to make it effective.

Water-jet Conductivity

ABOUT ten years ago tests were carried out by the Central Electricity Board to ascertain what risks were incurred through playing a "solid" jet of water on 132-kV lines. These showed that no special precautions were necessary with nozzles of $\frac{5}{8}$ in. diameter held 40 ft. from the lines, but that when the diameter was increased to $\frac{3}{4}$ in. or more the minimum safe distance became 60 ft. at least. These conclusions are generally supported by experiments in the United States recorded in this issue.

Quality Control

FROM the account of the operation of a quality control system which is given by Mr. A. S. Wharton in this issue, it will be clear that the clerical labour involved is actually less than it is with ordinary methods of inspection. Fewer inspectors are needed and their work is constructive rather than destructive, as it is when they are used mainly as sorters. Also, by relating sample results on a simple graph, and taking into account the law of probability, various trends can be readily demonstrated and action taken before a bad run is recorded on a machine, thus, so to speak, saving scrap before it is made.

An Army Hospital

Electrical Equipment in a Canadian Establishment

THE hospital which the Canadian Army has established in Southern England, although it is of a semi-permanent character, gives a good idea of the apparatus employed and the conditions encountered in the field. Typical of many similar establishments now being utilised in this country by the Canadian army, it has accommodation for about 1,000 in twenty-six single-storey wards, holding from thirty-five to forty beds. These wards, like the rest of the buildings, would in the field probably be Nissen huts, but here they are of brick and reinforced slab construction designed to give maximum protection against air raids. The various units forming the hospital are conveniently arranged round a central administrative block.

In the operating theatre there are four industrial type reflectors housing 100-W lamps over each surgical table with a number of portable "Prometheus" operating lamps on wheeled pedestals. In case the main electricity supply fails there is also over each surgical table a small lamp operated from a 30-V "Nife" emergency lighting set. To minimise risk of explosion in the anæsthetic-laden air, extract fans are installed, together with shutter-type mercury switches for all electrical outlets in the operating theatre.

The operating theatre showing the lighting arrangements and (right) portable operating lamps in use

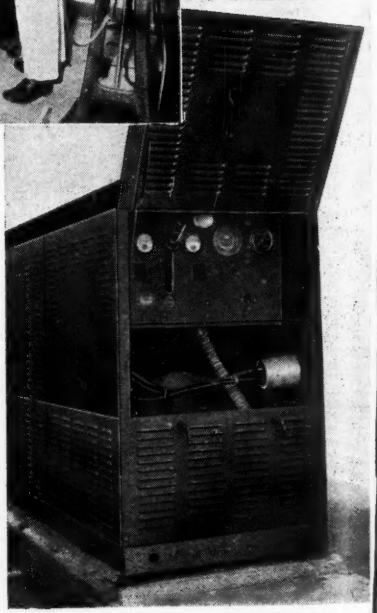
Full use is made of a particularly well-equipped radiology department and generally there are about fifty or sixty X-ray examinations a day. There are five separate X-ray rooms. Two are equipped for general work, one with an X-ray generator full-wave rectification 200 mA ("K × 12" G.E.) and the other with an X-ray generator self-rectifying 100 mA ("R 2" G.E.); both these installations are

Top: A patient receiving radiant heat bath treatment. Centre: One of the X-ray rooms. Right: One of the portable 25-kW generating sets

shock-proof. In the third room two bedside X-ray units, one G.E. 30 mA and one Westinghouse 15 mA, are employed in connection with an orthopædic table for foreign body localisation and for fracture reduction under screen. For preparing the barium metal there is a small electric mixer. Illuminated viewing stands are installed in all X-ray rooms, dark rooms and operating theatres. In the physio-therapy department facilities are provided for ultra-violet, infra-red, radiant heat and faradic treatment and every day about 350 patients are treated.

Among the apparatus installed in the laboratory are an electric autoclave, an electrophotometer and an electrical centrifuge. As this and much other apparatus brought from the other side of the Atlantic is designed to run at 110 V, transformers are provided to step down the mains voltage of 220 V.

Though most of the apparatus in the kitchens is steam-operated, there are an electrical three-pan fish fryer, an electrical mixing machine and mincer combined (Crypto) and a large Lightfoot refrigerator plant serving three storage rooms. In a service room adjoining each



of the wards there is an electric cooker to keep the food warm after it has been received from the kitchens; each service room also has an electric boiler for making tea, etc. Smith's synchronous electric clocks are fitted in all rooms and there is a Tangent fire alarm system. Crompton Parkinson motors of ¾ and 1 HP, respectively, running in duplicate at 1,435 RPM, operate the pumps for the hot-water service and for heating the building.

Normally, of course, the whole of the electrical equipment is operated from a supply provided by the local electricity undertaking. For emergency purposes, however, three 25-kW Burlec AC generators with exciter driven by a Ford " V8 " petrol engine are sufficient to enable the essential services to carry on until the main supply is restored. The procedure on the failure of the mains supply is to short-circuit the three-phase busbars and have the essential apparatus connected to the now common busbar and the neutral. In case of emergency or in the field these three generators would be sufficient to serve the whole hospital, one being used for the X-ray apparatus, one for the operating theatre and the other for general purposes.

We should like to thank the Canadian Army for granting us facilities to visit the hospital and also to Col. A. Ross, commanding officer of the hospital, and Major J. Gosselin, who is in charge of the radiology department, for their assistance in the preparation of this article.

The London J.E.A.

A NUMBER of matters of general interest are dealt with in the reports of Committees of the London and Home Counties Joint Electricity Authority for presentation at this week's meeting of the Authority, including post-war distribution, the cost of road reinstatement and access to mains in the vicinity of air-raid shelters.

Post-war Plan

The General Purposes Committee reports that the Barking Borough Council has expressed agreement in general with the proposals formulated by the Authority for electricity supply in London after the war. The Council, however, has suggested the following amendments:—(a) As to uniform tariffs, there should be no preferential treatment; (b) in view of the size of the area it would be advisable to establish district boards, with representatives elected by the local authorities in their respective areas.

Letters have also been received from the Crayford Urban District Council and Dartford Rural District Council giving their support to the scheme. Dartford R.D.C. further suggested that it should be extended to provide for the unification of gas undertakings in the district. (Further views on the plan are reported on page 762.)

Extension of Purchase Date

It is reported that the Electricity Commissioners have made the Kingsbury Electricity (Extension of Purchase Date) Order, 1943. This extends the period for the exercise of purchase rights by the Wembley Council over part of the undertaking of the Northmet Power Co. until June 24th, 1947.

Contracts for Transformers

With regard to annual contracts for the supply of transformers, the Local Distribution Committee reports that the contractors, through their Association, have drawn attention to the substantial increase in the cost of items other than the two—labour and copper—covered by adjustment clauses. In particular, reference is made to constructional steel and oil. The contractors have offered to continue the contracts if adjustments are incorporated to provide for the increased cost of these two items. The Committee recommends that this offer shall be accepted.

Reinstatement of Highways

The Conjoint Conference of Public Utility Associations has had under consideration the considerable increases made by some local authorities in their charges to public utility undertakings for road reinstatements, varying from 15 to 50 per cent., and has suggested that undertakings shall notify the Conference of further increases. The Local Distribution Committee has given instructions for compliance with the suggestion.

Shelters Near Mains

It is reported that the whole question of damage to, and interference with access to, service lines and pipes arising from the construction of air-raid shelters, water tanks, etc., on highways is at present being raised with the various Ministries by the Conjoint Conference. A recent circular from the London Civil Defence Regional Headquarters stated that the Commissioners were advised that (a) a local authority was under no legal liability to reimburse to public utility undertakings additional expense incurred by them in repairing their mains, etc., in consequence of the presence of shelters on the surface; and (b) public utility undertakings retained the right of access to their mains even if this involved temporary immobilisation of a shelter, but the undertaking was responsible for making the shelter good. The circular added that assurances already given to the Metropolitan Water Board and other utility undertakings by which local authorities bore the costs referred to should continue to be carried out in respect of existing shelters.

Islington Plant

Under the terms of the bulk-supply agreement with Islington it has been agreed between the parties affected that the Authority shall direct the removal of an economiser and boiler at the Islington station now unfit for further use.

Standard Electric Vehicle

One-Ton Model with Interchangeable Components

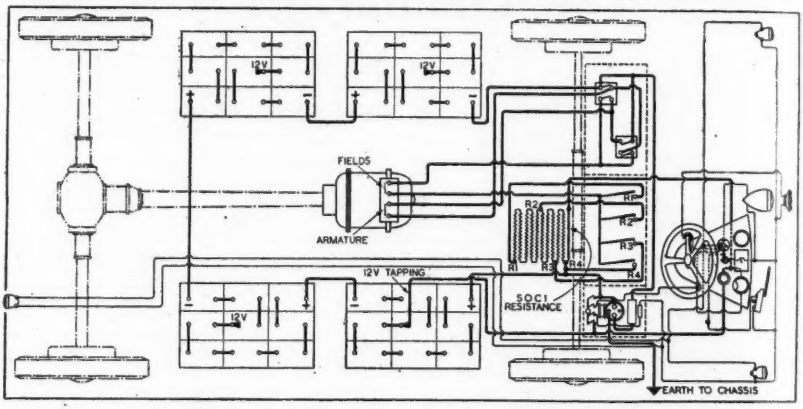
FOLLOWING a recommendation by the Ministry of Supply that designs of battery-propelled vehicles should be pooled with a view to establishing a standard type, a committee of eight manufacturers was set up by the Electric Vehicle Association of Great Britain. This co-operative work has resulted in the production of a one-ton pay-load model with all components interchangeable as between different makers.

The body, which is readily convertible to suit its particular duty, is directly mounted on cross-members of the chassis and the front is dropped to give easy access to the driving seat. The motor was built by the General Electric Co., Ltd., to a specification of the Ministry of Supply Machine Tool Control and follows B.S.S. 173-1941 as regards rating and construction. It is controlled by a Wilson delay-action four-speed controller with foot-operated hydraulic mechanism. A B.S.S. 50-A charging plug with interlocking d.p. isolating switch for the 12-V accessories is mounted on the controller.

Any lead-acid traction cell of D.P., Exide, Tudor or Young makes can be accommodated on the four interchangeable steel trays. The capacity of the thirty-six cell battery at the 5-hr rate is about 220 Ah. On the dash panel is mounted a suppressed-zero moving-coil voltmeter and the state of charge is ascertained by pressing a switch.

Transmission is direct from the motor to the rear axle. A short single-piece tubular shaft fitted with Layrub joints affords a cushioned drive requiring no lubrication. The rear axle casing is of one-piece banjo construction with helical first reduction and spiral-bevel final reduction; the high-tensile steel shafts are carried on roller bearings. The front axle beam is of H-section high-tensile steel and has inclined pivots. Radial-roller thrust bearings, taper roller-wheel bearings and self-aligning interchangeable ball joints on track rod and steering drag link are other features.

Marles double-roller steering gear with 18-in. wheel is employed. Lockheed-operated Girling brakes are fitted to front and rear wheels; the hand brake, of the Bendix telescopic pistol-grip type, functions on the rear-brake shoe through a mechanical rod-operated compensator. High-pressure low-loading tyres, 23 by 5 in. are fitted to the detachable steel-disc wheels.



Plan showing general arrangement of the new standard vehicle

The co-operating manufacturers are: Brush Coachwork, Ltd., Brush Electrical Engineering Co., Ltd., Electricars, Ltd., Metropolitan-Vickers Electrical Co., Ltd., Midland Vehicles, Ltd., Morrison Electricar, Ltd., Partridge, Wilson & Co., Ltd., and Victor Electrics, Ltd. The price of the vehicle (ex works), subject to war conditions, is £355 without battery and charger.

Miniature Hydro-Electric Station

A *Reuter* report from Moscow states that a miniature hydro-electric station which can be worked by a waterfall only 2 ft. high to operate radio sets has been produced. It is already in use on collective farms where it can operate 25 loudspeakers.

Statistical Methods

Practical Application in the Factory

By A. S. Wharton,
F.S.S., A.I.I.A.
(Philips Lamps, Ltd.)

THE theory of statistical control of quality has been dealt with in the *Electrical Review*,* and in putting forward this practical demonstration of the use of chart methods it is presumed by the writer that the reader already has some elementary knowledge of the subject. The mathematics involved is only very simple arithmetic. In order to introduce successfully into any factory a new control system it must be simple in detail and easily comprehended by the workpeople concerned.

There are two important methods of applying statistical quality control: the first is to a product coming up for inspection purely and simply by visual methods or "go" and "not-go" gauges, and the second to a product where actual measurement is entailed in respect of dimension, chemical content, etc.

To deal with the first case; there is a large variety of products to which it is quite impracticable to apply actual measurements and in many machine shops "go" and "not-go" gauges are used. A graph taken on a trimming machine is reproduced as fig. 1. This shows in the top part the number of rejects found on inspection by the "go" gauge and in the lower part the number of rejects found by the "not-go" gauge.

On this particular job the rate of production is 2,000 parts per hour and samples of 60 are taken every half-hour, being 6 per cent. of the production. These represent the last parts produced by the machine and are inspected by testing on a simple "go" or "not-go" gauge and a cross is placed opposite the number of rejects found for each gauge on their respective graphs.

Strict control is exercised in respect of the "go" gauge, where the errors must be controlled at below 2 per cent., whilst a certain laxity can be allowed in respect of the "not-go" gauge. Controlling at 2 per cent. on the upper graph, control lines are ruled in at 4 and 6 in accordance with the Poisson graph to be found in British Standard 600R-1942 (p. 81), representing the one in forty and the one in a thousand chances of occurrence.

This means that provided the number of rejects in our sample touches the lower line only once in forty times and the upper line once in a thousand times, we can be satisfied that the quality is being maintained at an efficiency of 98 per cent. The control lines on the lower chart are located at 7 and 10 as the control here is for 5 per cent. deficiency.

These charts indicate that the job when commenced in November was already running well below the control percentage at which we were aiming. Actually, after some five months' running the total reject proportion is now less than 1 per cent. and it has been found no longer necessary to plot "go" and "not-go" gauges separately.

In further explanation of these control lines, the following instructions are given to the inspector. If the sample taken contains as many rejects as our one in forty chance, then without waiting half an hour another sample is immediately taken. If this likewise contains as many or more rejects, the machine is stopped and the foreman informed of the trouble. If, however, at any time, a sample yields a reject result in excess of our lower limit of control then the machine is stopped at once, without further sampling.

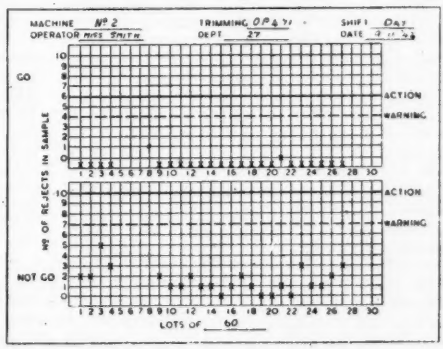


Fig. 1.—Graph illustrating the rejection of samples by "go" and "not-go" gauges

Developing this matter a little further, we can take into consideration a product coming up for inspection for more than one dimension such as the case of an auto-operation on a hank bush, a graph of which is given in fig. 2. Here the number of rejects found in the sample are still plotted on the vertical scale, but above this a very simple analysis of the cause of rejection is given. Each gauge is shown under the heading of "reason

* "Quality Control," H. Rissik, Feb. 26th, and "Avoiding Waste," March 5th.

for rejection " and rejects in turn are divided into " overs " and " unders."

The inspector, on examining the small sample of ten and finding two rejects at the same time, puts a 2 opposite the 0·280-in. diameter gauge in the " overs " column, showing that the cause of rejection here was due to diameter in excess of 0·283 in. At the end of the day's run, inspectors have a record of the quality for the day that not only enables them to decide whether or not they are successfully controlling the job at the percentage figure desired, but also supplies them with the chief causes of their difficulties analysed for present and future guidance. These graphs are then filed under their code number and in the case of short runs repeated they are re-used as occasion demands, the information on them being most helpful when setting up the job again.

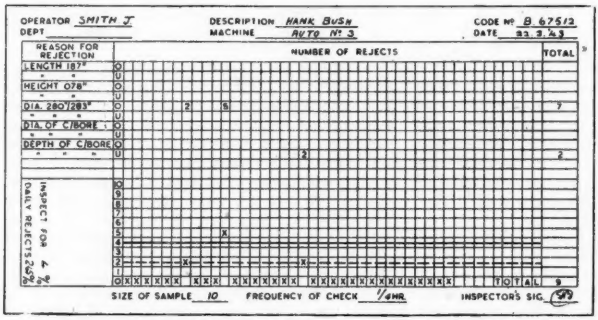


Fig. 2.—Method of inspection for more than one dimension

The question is often raised whether or not too much paper work is involved in the system. Taken on the average, one graph will cover anything from two to four days' constant run of production; moreover, instead of keeping account of figures, merely a cross has to be placed opposite a printed number. The chart method, therefore, in itself saves time, while providing the foreman, management and engineering staff with an excellent picture of how any particular machine or operator is working.

Regarding the probability lines ruled in, these are calculated very easily with the aid of B.S. 600R and, having decided the control percentage and the sampling size and rate for any particular job, the control limits can be overprinted on a batch of graphs in advance. Likewise, by watching the trend in results, action can be taken before any serious error occurs, thus saving scrap. No further record is required than the charts, and for reference purposes at a future date they give a very illustrative story of production efficiency.

Turning next to the products that come up for actual measurement, here the question is a somewhat larger one and cannot be dealt with briefly in great detail. On setting up a new job a fairly high percentage of samples would be requisite. From the actual measurements applied to these the individual results can be plotted on a measurement scale, the average of all averages found over a run of time, and on each side of this a measurable distance plotted of plus and minus 3·09 times the standard deviation of our results. The reason for a high rate of sampling at the commencement of the operation is to form some opinion rapidly as to whether or not it is practicable to work within the engineering limits set.

On the measurement graph in fig. 3 it was found that when production was proceeding normally our statistical limits fell well within our engineering lines, indicating the practicability of working, apart from machine error, to the limits set by the design department. In this case the tolerance worked to was 0·005. The value of deciding so early how far practicable the design limits are cannot be over-emphasised. Particularly in war production is it advisable to say in advance that a limit seems too fine and to investigate the possibilities of greater tolerance before producing scrap.

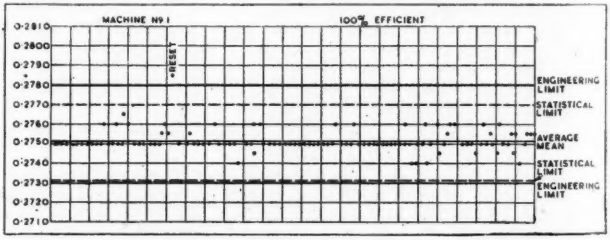


Fig. 3.—Test of practicability of design tolerances

Having set the statistical limits which fall

at our average mean plus and minus 3·09 times standard deviation, inner control lines can be fixed at plus and minus twice standard deviation. When production is proceeding on stable lines, we can safely say that these inner limits will only be passed once in forty times. Any tendency to erratic production due to either operational or machine fault will, therefore, be shown by a trend on the graph to either higher or lower limit, demonstrating that action is necessary if control is to be maintained upon the lines statistically indicated. As the job continues to run smoothly, measurement tests can be taken less frequently and, according to the type of work, perhaps a Poisson graph method might be instituted to replace actual measurement using sample "go" and "not-go" gauges. A few random measurements should still be taken throughout the day in order to keep in touch with any possible change.

To conclude, all that statistical methods require from a clerical point of view are the printing of some sampling sheets and the placing of a cross by the inspector opposite the number of rejects found in each sample. This, in itself, simplifies and brings up to date any inspection recording system, bearing in mind that these graphs after circulation through the various interested departments will, of course, be returned to inspection files to keep a permanent record of how a job ran on a certain date, the limits to which it should be able to run, the cause of the trouble and the action taken.

No further paper work is required unless management desires a master graph to be kept showing the percentage of rejects found from week to week in any given department on different types of machines, so that improvement or deterioration can be rapidly noticed and attention be concentrated in that section of the works where most difficulties are arising.

I.M.E.A. Notes

Proposed Amendment of Presidency Rule

As already announced, an extraordinary meeting is to be held prior to the annual meeting of the Incorporated Municipal Electrical Association in London on June 17th. From the May issue of the *I.M.E.A. Journal* it is learned that at this meeting the Council will submit amendments to the Association's articles so as to permit a local authority representative to be elected as President.

Business Two-part Tariffs

The Minister of Fuel and Power has recently been in communication with the Joint Committee of Electricity Supply Associations with regard to consumers charged on the installed wattage basis. He has requested the responsible Associations to ask their members to give consideration to all reasonable complaints with a view to making a suitable adjustment of the standing charge assessment of any business two-part tariff in cases where the installed wattage has been reduced if the continuance of such charge creates hardship. The I.M.E.A. Council expresses the hope that if any such complaints are made to undertakings they will accede to the Minister's request. Both domestic and commercial consumers were first mentioned, but the Joint Committee pointed out that only commercial consumers had been directed to reduce their lighting installations by regulations. It was argued that there was no evidence to substantiate a general reduction in spite of compulsory economy.

Coal Contracts

Both the I.M.E.A. and the Conjoint Conference of Public Utility Associations have for some time been considering cases in which coal other than that contracted for has been accepted as the result of an intimation, expressed or implied, by the distributors that the coal had been "directed" to the consumer and that he had no option but to take delivery. A letter circulated to members points out that the Ministry does not direct consumers to take delivery of coal and consequently must repudiate claims for reimbursement of the extra costs involved. At the same time, while a consumer cannot be compelled, under the powers exercised by the Minister, to take delivery of coal, it must be recognised that the fulfilment of contracts by collieries or distributors is always subject to any directions given in relation to the disposal of coal. Coal which is offered to a consumer in substitution for normal supplies is made available in order that his activities may not be interrupted; refusal of the coal so offered on the grounds that it is inferior can only be interpreted as an acknowledgment that the consumer does not need supplies.

Discharge Lamp Condensers

The Control of Industrial Electrical Equipment (No. 1) Order, 1943, includes "static condensers for power factor correction." It is reported that E.L.M.A., on making inquiries from the Ministry of Supply, has been informed that while primarily intended to cover power plant, the Order nevertheless includes condensers as used for electric-discharge lighting.

G.E.C. Well-Wishers' Club

THOUGH the growth of the country's armed forces is constantly increasing the responsibilities of the G.E.C. Well-Wishers' Club (formed in the early days of the war to provide parcels of comforts for members of the Head Office staff serving with the forces) these have been cheerfully accepted and parcels are being sent out in ever increasing numbers. Not merely has the volume increased, however, the variety of goods included in each parcel has been well maintained thanks largely to the foresight and energy of the governing committee.

The total number of "Well-Wishers'" parcels dispatched since the inception of the club had reached 15,000 by April 21st.

E.A.W. Conference

Viscount Samuel's Ideas for an Electrical Future

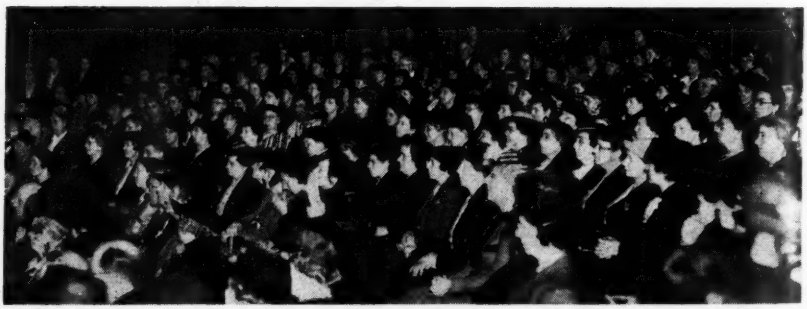
THE continued vitality of the Electrical Association for Women, despite the present restrictions on its normal activities was strikingly demonstrated by the remarkably good attendance at the Association's annual conference at the Institution of Electrical Engineers, London, on Thursday last week. Applications had actually to be refused to hear an address by Viscount Samuel on "An Electrified Future" which followed the formal proceedings.

Viscount Samuel addressing the conference. On the left are Miss Caroline Haslett and Lady Swaythling

Opening the conference the Dowager Lady Swaythling, the president, referred to the loss suffered by the Association by the deaths of Margaret Lady Moir, who had served as president and hon. treasurer, and Mrs. N. S. Atkinson, also a former hon. treasurer, and the assembly stood for a moment in their memory. The president then commented on the gratifying strength of the Association demonstrated by the attendance. The recent revival of interest in their aims, she said, had resulted in an increase in membership. Much of the success which had been achieved was due to Miss Caroline Haslett, the director and secretary.

Presenting the annual report of the National Executive Committee, Miss Haslett said that in these days of war a vast store of knowledge, both theoretical and practical, was being accumulated by women in the Services and in industry. The training, for instance, as electricians and as radio-location operators and mechanics had turned the thoughts of many women to the use they would make of their technical qualifications after the war and they looked to the E.A.W. for help in harnessing their newly-found powers to the peace-time pursuits of home-making and of industry.

The Association had studied the subject of post-war reconstruction throughout the branches and had prepared an interim report which might be accepted as an authoritative statement of the women's viewpoint. This report was being widely used and was helping to direct thinking on post-war matters. The Home Workers Certificate Scheme had been adapted to cover the education of Girls'



Some of the delegates at the E.A.W. conference in London last week

Training Corps, Women's Junior Air Corps and other similar organisations, as well as educational establishments.

In the drive for the careful use of fuel the pamphlet "Electric Economy" had met a real need, while to help in the solution of the Minister of Food's problem of maintaining the interest as well as the value of meals, the E.A.W. had contributed the invaluable "Cheerful Rationing" cards. To meet the necessity for spreading more accurate information about our war effort and our allies a platform and often the speakers had been provided. The Association's contribution to war savings, to comforts for the Forces, to all good causes whether local, national or international, had been considerable.

While the E.A.W., during wartime, had carried on its normal educational work adapted to current needs, it was aware of the gleam of victory on the horizon, mentioned in the Prime Minister's broadcast speech, and its thoughts turned to post-war work in which it undoubtedly had a great part to play. Electricity would be a prime mover in the colossal task of reconstruction, not only here but also in those lands long devastated by war. While our first responsibility would always be to our own country, the E.A.W. would naturally be pleased to place at the disposal of any other country its own pioneering experience in planning and in educational work in domestic electrification.

In presenting the accounts of the Association Miss F. E. Jones, hon. treasurer, mentioned that two new instructional charts were being published dealing with refrigerators and vacuum cleaners.

Officers and Committee

Lady Swaythling was re-elected president and Mrs. M. B. Jackson chairman, with Mrs. F. N. Rendell-Baker vice-chairman, and Miss F. E. Jones hon. treasurer. Mrs. H. Bentham, Mrs. F. S. Button, Alderman Mrs. Gregory and Miss L. E. Walter were re-elected members of the National Executive Committee, and Mrs. A. B. Lewis and Mrs. G. E. Tatchell were elected to fill the vacancies which had occurred through the retirement of Mrs. Squire and the death of Margaret Lady Moir.

Nominations of area representatives for co-option were confirmed. An alteration to the Association's constitution was approved relating to Students' Groups to the effect that these now cover "not less than six students, up to the age of 21 years, in any school or college or through any recognised youth organisation."

The Elizabeth Sloan Chesser Cup for the demonstrator who gains the highest marks in the E.A.W. Diploma Test was presented by the president to Miss Olive Poole of the Hampstead Electricity Supply Department, the first entrant who has achieved distinction in all three subjects, cookery demonstration, laundry demonstration and salesmanship.

Lord Samuel's Address

In his address Lord Samuel said that we now lived in an age of transition. The industrial revolution of the eighteenth and nineteenth centuries effected a rapid and complete change in the way of life of the country. We were now living in a second industrial revolution, in which chemistry, the internal-combustion engine and most of all electricity were playing a part. Till recently this country had been behind in the use of electricity, but it had made up for it in the last few years and now £100,000,000 a year was received from the sales of electricity.

The electrical age was still, however, in its infancy and only a little of what might be expected had so far been accomplished. Referring to some of the ideas expressed in his recently published book "An Unknown Land," which was intended as a sequel to Sir Francis Bacon's "New Atlantis," Lord Samuel pictured a Utopia where labour was so reduced that the Bensals, the inhabitants of an imaginary South Pacific island, had by the extensive use of machinery to work only nine hours a week, having the rest of their time free to spend as they liked. He believed that with the right organisation and intelligent use the machine would, far from imposing slavery on man, rescue him from it and give him a freedom hitherto unknown.

In the houses of the future all rooms might be air conditioned and the need for drainage might be eliminated by the use of small electric furnaces in the houses. Communal kitchens and laundries would remove much of the drudgery from the home. By the universal use of electricity the air everywhere would be clean and there would be no fumes. Only half an hour a day would be required for house cleaning.

Power cables would serve all farms, electric tractors would provide all the labour, weeds having been eliminated scientifically. Some of the fields might be roofed over by a material such as "Cellophane" and the space inside heated by cables and radiators to produce yields many times the normal. If the cost of power continued to fall and machinery was utilised to a high degree there was no reason why this state of affairs should not eventually be achieved.

Radio in Cars

The Postmaster-General stated in the House of Commons last week that he could not remove the ban on radio receivers in cars. Security and lack of equipment were two reasons for this decision, among others.

Engineering Economics

Teaching the Basic Principles

By Reginald O. Kapp, M.I.E.E.

BY the paper* he read recently before a joint meeting of the three senior engineering institutions Sir Frank Gill has drawn renewed attention to the importance of finance in engineering work. Full consideration of most engineering proposals must include consideration of their cost and often also of a comparison of their cost with that of other alternative proposals. If he is to do his job properly, every engineer in an executive position must be not only technically but also financially minded.

It is an open question whether it is better to prepare him for this two-fold conception of his responsibilities during his college training or to devote the undergraduate years entirely to technical work, leaving the young engineer to discover the importance of economics after he has entered his profession. The answer must depend largely on the amount of time allowed for undergraduate studies. The years spent at present between matriculation and graduation are so crowded with indispensable technical subjects that nothing more can be squeezed in. Yet it is doubtful whether this training suffices, even on the technical side.

The author is Pender Professor of Electrical Engineering at London University

In the fiercely competitive world which we must expect after this war our country will be geographically at some disadvantage ; we shall only be able to maintain a reasonable standard of living if we combine technical pre-eminence with a strict economy of effort; we shall not be able to regard any engineering proposal as good enough so long as its purpose can be achieved equally well in a more economical way. So I believe that self-preservation will force us to devote an additional year to the training of our engineers, a year which will have to be used partly to achieve a higher standard of technical education and partly to broaden the engineer's knowledge by the inclusion of non-engineering subjects. Among the latter, engineering economics is bound to take an important place.

Existing objections should not, therefore, preclude us from considering how engineering economics should be taught if and when it becomes part of the syllabus. Here, perhaps, my own experience in giving some elementary instruction in the subject may be of interest.

For the last eight years I have devoted about a dozen hours of the so-called "Electrical Power" course to economic considerations. Though this time is inadequate, it is as much as I can spare, and might perhaps be thought more than I ought to spare, from a series of lectures designed to deal with generation, transmission and utilisation of electricity.

It has first to be decided what result is aimed at by the teaching of engineering economics. Certainly not to give the young student the full knowledge of financial matters which a highly placed executive officer in an engineering works requires ; certainly not so that the engineer who is employed in a technical department may be able to do the accountant's job.

Engineering education does not and must not aim at the training of specialists. This is recognised in the present wide range of subjects taught. Electrical and mechanical engineering students are required, for instance, to follow a course of study in surveying. This is not because they are likely to have any surveying to do in their future employment, but partly because surveying provides a valuable training in neatness and accuracy and partly because electrical or mechanical engineers ought to know something of the point of view of their civil engineering colleagues.

We insist, similarly, that every engineer must have some practical experience in engineering shops. This is not because he is ever likely to have to work a lathe or make the pattern for some casting during his professional career, but so that he may learn to understand the problems with which skilled workmen and foremen have to cope. One important side of engineering education is to train men to appreciate other men's jobs, for every piece of engineering work depends on the concerted effort of many collaborators and each of these can only co-operate effectively with his colleagues if there is mutual understanding.

So the young engineer whose contribution to an engineering scheme is quite a humble one will be a more valuable member of his team if he realises that the technical considerations with which he is entrusted are not the only ones and that the completed work will be influenced also by considerations of expenditure. To this end his training at

* *Electrical Review*, March 26th and April 2nd.

college does not need to be very comprehensive. It is better to give him a grasp of the basic principles of engineering economics than a detailed knowledge of all its applications.

With basic principles to build on he will be able to add such additional knowledge as may be required from what he picks up as he approaches an executive position. If, however, he begins his career in complete ignorance of costing and finance these subjects are likely to remain for ever a closed book to him. There are many engineers with high technical qualifications whose sense of proportion in matters of economics is quite inadequate. With only a little early training they would have become both more useful and more successful than they are.

Relating Principles to Practice

Even when basic principles only are to be taught they should be illustrated with the help of engineering examples or they will appear too abstract and theoretical to the student. It is not very important what illustrations are chosen provided they are a fair sample of the type of problem likely to be met in practice, that they are simple and that they cover sufficient ground to illustrate every principle which is being taught.

In teaching the principles of costing the second of these requirements is best met if the illustrations are chosen from an industry in which the number of commodities made and sold is small, for then complicated questions of allocation of oncosts between various products do not arise. For this reason the electricity supply industry is ideal. One may regard it as concerned with one commodity only, though it is more correct from an accountant's point of view to speak of four, namely, kW, kW-hours, kVar and kVar-hours.

The principles on which costs are allocated between these four are easily demonstrated; the distinction between fixed and running costs (oncosts and prime costs) is readily understood; discussion of the relative importance of capital charges, coal costs and the other items which make up the cost of electricity inculcates in the student a proper sense of proportion.

Electricity supply problems do not, however, by themselves cover all the ground. There are problems where minimum expenditure is a function of some controllable variable. Kelvin's law of cables is an illustration which it is useful to discuss at some length together with allied problems such as the economical span of an overhead transmission line. Other problems involve a choice between alternatives. It is advisable to select these from a wide field so that the student may realise how universal cost comparisons are.

Problems may be set in which the student has to decide whether it pays to employ soot blowers in a boiler house, whether the cost of power-factor correcting plant is justified by a saving in the electricity bill, whether for a given transmission line wooden or steel supports are cheaper, whether it is more economical to purchase a cheap transformer with high losses or an expensive one with a high efficiency, whether a painted or a galvanised steel structure is the more economical, whether an electricity generating station should install additional plant or purchase a bulk supply to meet an increasing load, to give only a few examples from unlimited possibilities.

Any examples given as illustrations or exercises should not be too complicated. Each should be solvable within at most one hour and preferably within half an hour. Corresponding problems met with in practice usually take much longer, often days or weeks work. But in teaching, time efficiency has to be considered and so the teacher must provide data which the engineer would in practice have to calculate or collect for himself. The examples must also demand a maximum of reasoning power and understanding and a minimum of dull plodding work. The student's time must not be wasted with purely mechanical calculations and tabulation.

Interlinked Subjects

The student must not be allowed to think that engineering and economics are two separate subjects each in its own watertight compartment. So it is important that technical and economic considerations should be discussed at the same time. Generating costs of electricity may be usefully associated with the thermal balance sheet of a generating station; the technical reasons why a Willans line cuts the Y-axis can be explained; problems in the economics of power-factor correction can be so set that the student has to draw vectors or calculate $\tan\phi$; problems of the "Kelvin's law" type can be so devised that losses which are proportional to the square of the load have to be taken into account; stress-sag calculations can be linked with those of expenditure on transmission lines; load factors can be associated with economic considerations in a variety of ways.

It is further important that the student should be encouraged to treat the result of all calculations in engineering economics with some reserve. The mathematical and technical training which our students receive leads them to attach too much importance to arithmetic and too little to imponderables. In the teaching of engineering economics we have an opportunity to correct this defect. We can explain to them that prices fluctuate, that the economic life of plant is nothing but guesswork, that no one can prophesy the load factor at which any machine will be working five years hence, that every conclusion must be qualified with the words "other things being equal," that many engineering

decisions are not the result of precise knowledge but are based only on reasonable assumptions, that a sense of proportion is as valuable to an engineer as skill in solving mathematical problems.

Finally, engineering economics provides an opportunity for giving the student some idea of the organisation of the engineering world. Discussion of generating costs, power-factor adjustment, the economics of interconnection and bulk supplies leads naturally to a description of the functions of the Electricity Commission and the Central Electricity Board and to a brief account of electricity legislation and the part played by institutions, associations, and committees. In this way the student is helped to avoid a too-individualistic view of his science; his mind is opened to the wide range of contacts with other persons which he may expect in the course of his career, to the diversity of the points of view which contribute to every successful scheme in engineering, to the great degree of co-ordination which the engineering world has achieved.

PERSONAL and SOCIAL

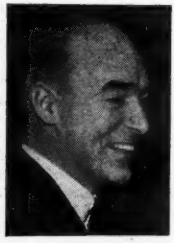
News of Men and Women of the Industry

IT is announced in the *London Gazette* that **Corporal G. F. Ames,** Royal Corps of Signals, has been awarded the Military Medal, for gallant and distinguished services in the Middle East. Before joining the Forces, Corporal Ames was associated with Ames & Son, electrical and radio engineers, of Bognor Regis.

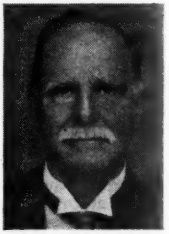
We are interested to hear from **Lieut.-Commander J. C. Turnbull, A.M.I.E.E., R.N.V.R.,** who before the war was Yorkshire representative for the Midland Electric Manufacturing Co., Ltd. He tells us that since the war began he has been in destroyers and an aircraft carrier and "has seen a bit of action as well as a bit of the world." In March of this year he was promoted to his present rank and has now a job ashore. For a year he was on the staff of Lord Louis Mountbatten in H.M.S. *Kelly*.

Birthday Honours.—The list of honours awarded on the occasion of the King's birthday was to be published in two parts on Wednesday and Friday this week. Particulars of the distinctions awarded to members of the electrical profession and industry will appear in our next issue.

Mr. C. T. Melling, whose appointment as borough electrical engineer of Luton has now been confirmed by the Council, was born at Wigan in 1899 and later lived in Manchester. After passing through the Central High School he took an electrical engineering course at the Manchester College of Technology (University of Manchester) and gained the degree of Master of Technical Science. After practical training in the works of the B.T.H. Co. at Rugby and the Metropolitan-Vickers Electrical Co.'s Works at Manchester he was appointed to the staff of the latter company as a research engineer in the Trafford Park research laboratories. Subsequently he served as a design engineer and later as a commercial engineer in the Electrical Plant Department. Mr. Melling obtained experience of electricity supply with the Yorkshire Power Co. and later with Edmundsons Electricity Corporation, Ltd. In his position in the Management Department of Edmundsons he has been able to specialise in electricity supply economics, and recently presented a paper on "General Factors Affecting the Unification of Electricity Supply Tariffs" to the Institution of Electrical Engineers which awarded him the Llewelyn B. Atkinson Premium. He is a member of the I.E.E. and an associate member of the Institution of Mechanical Engineers.



Mr. C. T. Melling



Mr. W. D. Snape

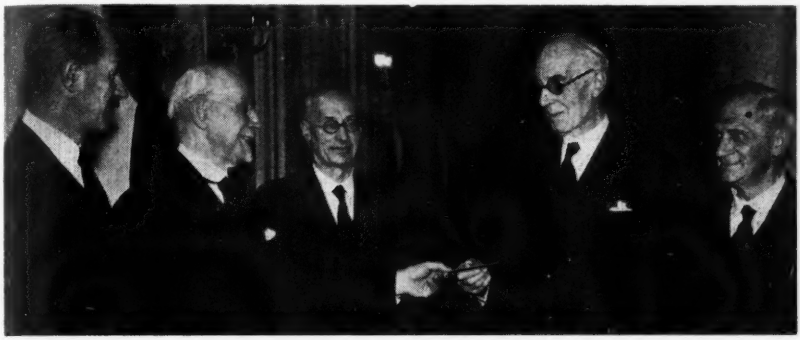
Mr. W. D. Snape, governing director of L. Andrew & Co., Ltd., manufacturers of electrical insulating materials, Manchester, completed fifty years' service with the company on June 1st. Mr. Snape joined the company when it was formed by the late Mr. L. Andrew in 1893, and has held every post in the concern. The company this year also celebrates its jubilee.

Mr. H. W. Lodge, street lighting overseer at Burnley, has been appointed street lighting superintendent to Halifax Corporation. He joined the lighting section of Burnley Gas Department in 1924 as a clock and instrument maker and has worked in close co-operation with the electrical engineer.

At the annual meeting of the Association of Consulting Engineers on May 27th an antique silver cup was presented to **Mr. R. J. Harvey,** M.Inst.C.E., M.I.Mech.E., M.I.E.E., on his relinquishing the office of joint hon. secretary which he had held for over six years.

As we briefly reported in our last issue, a farewell luncheon was given by the British Engineers' Association on May 20th at the Waldorf Hotel, London, W.C.2, to **Mr. D. A. Bremner,** O.B.E., who has retired from the position of Director of the Association. Following the luncheon, Sir William Reavell presented Mr. Bremner with a cheque as a gift from the members of the Association. Mr. C. Bentham, president, said that he spoke not only for himself but for all members of the Association as

well as for other people in expressing appreciation of the work that Mr. Bremner had done for the Association and for the whole of the engineering industry during the last twenty-five years or so. He hoped that they would continue to benefit by the advice which Mr. Bremner would be able to give them, even although he had retired from active directorship of the Association.



The presentation to Mr. D. A. Bremner. Left to right: Lt.-Col. Lord Dudley Gordon, D.S.O., Sir William Reavell, Mr. C. Bentham, Mr. D. A. Bremner and Mr. J. J. Carter

Sir William Reavell, in presenting the cheque, reviewed the activities and development of the Association during Mr. Bremner's term of office in illustrating some of his many-sided activities on behalf of the Association.

Mr. Bremner, in reply, paid tribute to the loyal services of his staff and mentioned that they had presented him with an inscribed cigarette case. He said that he had been trying for a quarter of a century to arouse interest in the formation of a British Engineering Federation. He considered it essential that there should be a representative body which, on certain major questions of policy, could speak for the engineering industry as a whole.

Mr. G. Chelioti

Mr. G. Chelioti, whose portrait we reproduce, is one of three new directors of the General Electric Co., Ltd., whose appointments were mentioned last week.

In reporting the nominations of officers of the Birmingham Electric Club in our last issue we regret that the date of the extraordinary general meeting was wrongly given. The meeting is to be held on June 21st.

The L.N.E.R. announces the following appointments: **Mr. A. E. Tattersall,** signal and telegraph engineer (London), to be assistant chief engineer (signals); **Mr. E. A. J. Bilham,** senior assistant, Engineer's Office (London), to be acting district engineer, Leeds; and **Mr. E. D. Robinson,** acting district engineer, Cambridge, to be district engineer, Cambridge.

With regard to our last week's note on Ashton-under-Lyne, **Mr. J. Harwood Lumsden** informs us that while arrangements were made for him to act in a temporary consultative capacity during the negotiations with the Stalybridge Board, he has actually never acted in that capacity.

Mr. E. W. Richmond, a director of Joseph Sankey & Sons, Ltd., and general manager of their Bankfield Works for over twenty-one years, tells us that he is retiring from the business at the end of this month.

Sir William Wood (L.M.S. Railway) has been elected by the Council of the Institute of Transport as president for 1943-44.

Obituary

Mr. F. R. Marsh.—The death occurred on May 20th at Tunbridge Wells of Mr. F. R. Marsh, M.I.E.E. Early in his career Mr. Marsh was employed as a draughtsman by S. Z. de Ferranti, Ltd., and in 1899 joined the firm of Preece, Cardew, Snell & Rider, consulting engineers, for whom he acted as resident engineer on a number of contracts, including Warrington Corporation Tramways and electricity supply schemes at the R.N. Dockyards at Gibraltar, Chatham and Malta. In 1909 he was appointed chief electrical engineer to the Singapore Harbour Board, a position which he held until 1921, when he became manager of the Hongkong Electric Co., Ltd. The business of the company prospered under his guidance and the power station at North Point was a monument to his foresight and ability. He returned from the East in 1930 to take up the position of consulting engineer and London representative of the Hongkong Electric Co., Ltd.

Mr. T. G. Blackwell.—The death has occurred at the age of fifty-eight of Mr. Thomas Geoffrey Blackwell, who was a director of the Brentford Electric Supply Co., Chesham Electric Light & Power Co., Chipping Norton Electric Supply Co., Egham & Staines Electricity Co., Metropolitan Electric Supply Co., Notting Hill Electric Lighting Co., Slough & Datchet Electric Supply Co., Uxbridge & District Electric

Supply Co. and the Windsor Electrical Installation Co.

Mr. F. W. S. Hawtayne.—We regret to learn that Mr. F. W. S. Hawtayne, B.Sc., A.K.C., A.M.Inst.C.E., superintending civil engineer on the Admiralty staff, who was reported missing through enemy action in October last, is now presumed lost, together with his adopted son. Mr. Hawtayne was the younger son of Mr. W. C. C. Hawtayne, M.I.E.E., the consulting engineer.

Mr. James Boyd, works manager of Balfour Beattie & Co., Ltd., with whom he had been employed since 1927 in connection with their hydro-electric schemes in Perthshire and Inverness-shire, has died at his home in Kingussie. He was previously engaged in connection with Euphrates and Tigris irrigation schemes.

Lady Pender.—We regret to record the death, on May 29th, of Lady Pender, wife of Lord Pender, governor and managing director of Cable & Wireless (Holding), Ltd.

New Books

High Vacuum Technique. By J. Yarwood. Pp. 106; figs. 62. Chapman & Hall, Ltd. 11, Henrietta Street, London, W.C.2. Price 10s. 6d.

It is just three hundred years ago since Torricelli first demonstrated the existence of a vacuous space above the level of the mercury in a barometer tube. The properties of this kind of vacuum have since been investigated and the subject developed by such pioneers as Gæde, Langmuir, Dushman, Knudsen and Campbell. It is true to say, that research in this field has so far produced its richest dividend for human welfare, and this has occurred in our own generation. As proof of this, we need only take vacuum devices such as the electric lamp, wireless valve, X-ray tube, vacuum flask, photo-electric cells, cathode-ray oscillograph, and vacuum spectrometer.

The present monograph attempts to deal in some seventy pages with the basic principles involved in present-day vacuum practice, and the techniques employed in utilising these in the laboratory and factory. The treatment is for the main part practical and there are numerous diagrams to illustrate the text.

As an introduction to the subject the beginner will find much to interest him—production of high vacua, measurement of pressure, pump speeds, vacuum reactions at high and low pressures, and degassing and gettering technique. Practical applications in industry, *e.g.*, eddy current heating, preparation of photo-cells and sputtering of metallic films, are also described. An additional thirty pages devoted to properties of materials under high vacuum conditions is of real use even for the specialist. The latter will also find tables of data on pressures, pump speeds, gas constants, etc., which are helpful for reference.

By way of criticism, the description of the demountable tube types, with method of connection through glass, should be amplified. These have helped greatly to increase the rate of growth of new knowledge and are a boon to all classes of workers. Again, to be strictly logical, Chapter 3 might be better placed after Chapter 1. The general impression gained on reading the book is that of scrappiness, due doubtless to the inevitable limitation of space. In spite of the fact that a large amount of useful information has been gathered by the author for those who seek it, let us hope that the next edition will be a good deal fuller.—L. J.

Accumulator Charging: Maintenance and Repair. By W. S. Ibbetson. Eighth edition. Pp. 171; figs. 42. Sir Isaac Pitman & Sons, Ltd., 39, Parker Street, London, W.C.2. Price 6s.

Except for the addition of selected questions from recent City and Guilds of London Institute examination papers, with solutions to the arithmetical problems, and a special appendix dealing with the "lay-up of motor car batteries for the duration," this edition is practically identical with the seventh edition which was issued in 1941.

The Cathode Ray Oscillograph in Industry. By W. Wilson. Pp. 148; figs. 156. Chapman & Hall, Ltd., 11, Henrietta Street, London, W.C.2. Price 12s. 6d.

In the review of "Basic Electricity and Magnetism" (Pitmans) which appeared in our issue of May 21st (p. 680), it was suggested that the answer to one of the test questions was incorrect. Our reviewer regrets that this statement was due to a misapprehension on his part.

Radio Feed-back

THE May meeting of the London Section of the British Institution of Radio Engineers was addressed by Mr. S. Hill on the "Application of Negative Feed-back in Design Principles"

The lecturer stressed the fact that the simple introduction of a negative feed-back system did not immediately dispose of distortion in an amplifier as was, in his opinion, popularly supposed. Fundamentally, what it did was to reduce the gain, and the reduction of distortion was achieved by restoring the output to its original value by an increase of input. An ordinary volume control would have the same effect, but negative feed-back operated at a point that was inaccessible to volume control.

That was true in broad principle, but input and output impedances were modified by the introduction of feed-back, and they and frequency discrimination could be governed by it. Various methods of voltage-fed and current-fed sources of feed-back, or combinations of the two, could be used to produce complementary effects in terms of impedance and gain, while a "diagonally" connected impedance would influence the gain, selectively if required, without modifying the impedance.

Two closely related factors were phase shift and stability, and in preparing a feed-back design it was necessary to determine the relationship between the fall of gain and rise of phase angle in a circuital period over a frequency range several times as wide as that which the amplifier was required to handle in order to achieve stability.

The lecturer's arguments were supported by explanatory diagrams, leading finally to a complete hypothetical amplifier design.

CORRESPONDENCE

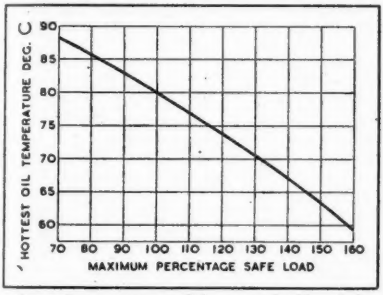
Letters should bear the writers' names and addresses, not necessarily for publication. Responsibility cannot be accepted for correspondents' opinions.

Safe Loading of Transformers

THE author of the article "Transformer Loading" published in your issue of May 7th states that "with many self-cooled units operating on a known load cycle . . . critical values of hottest-oil temperature can be stated by the manufacturer."

The hottest-oil temperature is easily measured on a transformer in service and it is well, therefore, to examine what information as to the safe loading conditions can be obtained from it. Using the notation given in my recent article (February 5th issue): $H = T + A + P^{1.5} G_n$, where G_n is the winding gradient at full load and P is the maximum safe load as a multiple of full load.

A typical curve showing this relation for an average oil-immersed self-cooled transformer is given herewith; similar curves can



Curve for an average oil-immersed self-cooled transformer

be drawn from the design data for any given transformer. It is clear from this curve that there is no single critical value of hottest-oil temperature.

The practical use of the curve has been pointed out by the late Mr. G. L. Porter. It gives the maximum oil temperatures for different loads. If, for instance, in the example the load is 120 per cent., the oil temperature must not be allowed to exceed 73·7 deg. C. Whether the transformer is able to carry this load continuously depends upon the air temperature.

The curve, in fact, may be applied to temporary as well as to continuous loads. An overload of 30 per cent., for instance, in the example may be applied until such a time as the oil temperature reaches 70·3 deg. C, and this is true, no matter what the previous loading conditions, if within the safe rating; *e.g.*, where the transformer has previously been on full normal load or even on no-load. The use of this relation gives results slightly on the safe side for short-time heavy overloads, since it does not take advantage of the thermal time constant of the windings. Again, suppose at a given instant the hottest-oil temperature of this transformer is 75 deg. C, but the previous loading history is unknown, the curve states that any load up to 116 per cent. may safely be taken from the transformer. How long this load could be taken depends upon the air temperature, but always so long as the oil temperature does not exceed 75 deg. C.

The curve also shows the possible danger of using hottest-oil temperature as a protection or alarm device. Suppose in the example the oil thermometer were set to operate the alarm when the hottest-oil temperature exceeded 80 deg. C, the curve shows that the alarm would be given quite unnecessarily so long as the load were below 100 per cent.; on the other hand, the transformer might be carrying a load greater than 100 per cent., and greater than the maximum safe limit without the alarm functioning.

Hollinwood. E. T. NORRIS.

The Maintenance Engineer

MR. J. ALLEN, writing in the *Electrical Review*, of May 28th, partly blames the "characteristic reticence" of the maintenance engineer for his lack of recognition by those above him. It can be truly said of engineers in supervisory positions in nearly all branches that recognition lags well behind the services rendered, but Mr. Allen is missing an important point.

Very often the stumbling-block is not so much the shyness of the maintenance man as his inability to talk in any language but his own. Directors, and to a less extent works managers—to whom Mr. Allen specifically refers—tend to think in terms of money and maintenance engineers in terms of bearings, windings and brushgear. I think the maintenance man has the better outlook—he is nearer to real things—but is it not up to him to make known his value in the language of the people who pay for his services? He needs to translate his daily work into so much money saved, both directly in replacement costs and indirectly in "idle time" costs, and so justify (I might almost write "glorify") his existence in the eyes of a non-technical employer.

The action in unison to which Mr. Allen refers should be largely self-educative: this casts no slur upon the knowledge and intelligence of a splendid branch of the industry, for lack of ability to make the most of their

own financial worth is characteristic of most keen and efficient engineers.

To avoid even the least appearance of trespassing upon your valuable space with ulterior motive, may I observe that the opportunities for such action are provided whenever responsible bodies of like-minded engineers meet for discussion of the technical, economic and practical aspects of the industry they serve so well? A. BRAMMER,
London, W.C.2. *General Secretary,*
Assn. of Supervising Electrical Engineers

I.E.E. Graduates

WITH reference to the letter by "Misused" in your issue dated May 21st, the undersigned have represented the unworthiness of their employment to the Central Register, but without apparent result.
SEVEN GRADUATES, FIVE STUDENTS AND FOUR OTHERS.

Motor Standardisation

MR. MARRYAT is to be congratulated on his bold attempt to achieve the mass production of utility pattern motors over a range of, say, 1 to 50 HP. Dimensional standardisation might be a commercial proposition, and even present a golden opportunity for large combines to monopolise the electric motor industry, but such standardisation is greatly to be deplored on engineering grounds.

Although the present-day tendency is to reduce the power-to-weight ratio (especially for machine tools), it has apparently been overlooked both by the author and his subsequent commentators that a motor often has to be generous in dimensions (shaft diameter and carcase) to withstand certain mechanical stresses, such as are experienced on rolling mills, presses, stampings and in collieries. It is inconceivable that a fully standardised motor of 50 HP could undertake, with equal ease and efficiency, all the industrial duties that demand an equivalent BHP output but which vary widely in mechanical as well as electrical characteristics.

The B.S.S. ruling for full-load temperature rise is accepted by all electric motor manufacturers as a fair basis, although they may differentiate very considerably as to the degree of approach to this standardisation. There is surely, however, less reason for curtailing $D^2 L$ fundamentals, which are usually left in the capable hands of motor designers to suit individual industrial requirements. Each application must be given careful consideration and expert calculation.

The value of interchangeability and standardisation of electric motors has been grossly exaggerated by some. They are irrelevant provided a good quality motor of robust construction is specifically chosen to suit a particular duty and is adequately protected by control gear of equivalent high quality. Replacements are exceedingly rare, and reliability with consequent trouble-free service is assured.

Any further standardisation for all motor manufacturers would not only cause stagnation and the prevention of progress, but would introduce a measure of red tape into an energetic industry which has thrived on healthy competition. Finality in design has by no means been achieved.

Sutton Coldfield. GEO. C. SOFIANO, M.A.I.E.E., A.I.E.E.

Consulting Engineers

Royal Charter Suggestion

THE annual report of the Association of Consulting Engineers shows that during the year ended April, 1943, the chairman made twenty-one nominations in response to inquiries for the services of members, who now total 180, the highest in the Association's history; there were seventeen enrolments during the year, six of them being electrical engineers. Because of the temporary removal of the offices of some members to the provinces the advisability of amending the definition of the expression "London member" for the purpose of committee elections is to be considered, as is also the desirability of applying for a Royal Charter. In view of the difficulty experienced by members in meeting one another for the discussion of matters of mutual interest, informal quarterly gatherings are to take place regularly.

Having concurred in a scheme for providing engineering assistance in the event of emergencies arising from air attacks, selected firms of consulting engineers have placed their services at the disposal of the authorities in co-operation with municipal technical officers. The Association is maintaining contact with Government Departments in respect of activities during and after the war. Although increasing membership has correspondingly enlarged receipts, the Association is constantly hampered by lack of funds essential to proper development while there is also need for the establishment of a reserve or contingency fund. A satisfactory solution of the difficulty has not yet been found.

Music in Factories

IN the House of Commons last week Mr. Lyttleton (Minister of Production) announced that a satisfactory settlement had been arrived at of the difficulties raised in connection with the relaying of broadcast and gramophone music in factories. In consideration of lump sum payments of £25,000 to the Performing Right Society and £7,500 to Phonographic Performance, Ltd., the managements of factories engaged in essential work, together with hostels and canteens connected with those factories, would be able to relay broadcast and gramophone music without charge. The agreements would continue so long as the Emergency Powers (Defence) Act remained in force but were terminable at one month's notice after one year from May 6th upon which date the agreements became effective.

Wartime Contracts–I

Points of Interest in Canadian Practice

By E. Arthur Pinto,
A.M.I.E.E., M.E.I.C.

CRIMINAL proceedings have been instituted recently against a number of high officials of an important munitions manufacturing firm in Canada, the charges relating to alleged falsification of accounts, padding of expenses, and so on, in connection with the costing for war contracts. It is probable that this particular instance has received the more widespread attention because of the fact that such cases are extremely rare. This in turn is an indication of the success which has attended Canadian efforts to place the whole business of wartime Government contracts on a sound and equitable basis and as most of what has been done is applicable equally to English practice it may be of interest to consider some of its salient aspects.

The author, who has been in Canada on a Ministry of Supply Commission for the past two and a half years, is well placed to review a subject of considerable interest to manufacturers employed on Government contracts

The ideals to be aimed at in such business include (*a*) keeping the cost to the nation as low as possible, (*b*) allowing the contractor a reasonable profit, and (*c*) combining with these conditions the assurance that there will be no incentive on the one side towards extravagance and, on the other, towards inflation of the reasonable profit by scamping.

Apart from the general considerations governing all contracts, there are two particular conditions applying in war contracts which are largely absent from ordinary commerce: (*a*) the need to avoid delay through protracted preliminary negotiations and (*b*) the fact that firms are called on to manufacture goods of which they have no previous experience or data and for which they are therefore unable to estimate with confidence or at a competitive level.

Methods of Payment

How, then, can the foregoing aims and conditions be so reconciled as to produce a system of payment which shall be equitable to both sides? Broadly, all systems fall under one of two main classifications: 1, "lump sum"; 2, "on-cost" or "time and material." The former appears at first sight to be the more desirable, but investigation tends somewhat to modify this view. Not only does it often operate unfairly to one side or the other, or in some cases to both sides, but there are many wartime instances which render it impossible of achievement. It is true that it enables both sides to know in advance the amount of money involved, though this information is often entirely upset by unexpected events.

On the Government side, assuming that as a primary safeguard against being overcharged the contract has been awarded after competition, how far can this be relied on to secure the lowest reasonable price? The knowledge that their competitors are very fully engaged is an inducement to tenderers to submit a high figure on the "all or nothing" principle and the operations of price-rings and cartels are not altogether unknown in this respect. The outstanding advantage to the Government of the lump-sum contract is the avoidance of the necessity to keep a continuous check on the manufacturers' costs. On the contractor's side, the advantage of knowing what he is going to receive is largely offset by the fear that his estimators may have been "out" owing to their imperfect knowledge of what is involved in the manufacture of goods hitherto unknown to the particular firm. However, it may be maintained with some justification that the lump sum system is as nearly a satisfactory one as is likely to be attained, provided that the accompanying circumstances are suitable for its operation.

Alterations of Design

One difficulty repeatedly arises with such contracts: the alteration of a design after production has been commenced. In one such case, where the product was a very large and costly piece of offensive armament, one section was assembled by riveting. On trial on active service this was found to be unsatisfactory and welding was decided on (with entirely satisfactory results, it may be mentioned). This necessitated new drawings and parts, additional plant, much scrapping of used and partly-used materials, and so on. The effect on the contract, which was for a lump sum per unit, can be imagined. Yet at the initiation of the contract this appeared to be an ideal case for a lump sum quotation.

In England, there used to be a widespread belief that a major variation such as that just described would vitiate the contract. Lawyers do not appear to give much support to this view, but whatever its force in peacetime there can be no justification for it during war, particularly when the Government is the employer, for the latter has such complete control over manufacturers, their

raw materials and their products that there can be no hope at all of invoking legal aid. It is fortunate that practically without exception manufacturers on both sides of the Atlantic are so anxious to do their duty by their country that little ground for worry exists on this score. It is, however, as well to be reminded of the existence of these powers which ensures that in the odd case where the contractor tries to "ride the high horse" he is likely to come in a bad second.

In one particular case, a manufacturer wished to use a component varying slightly in size from that called for but of which he had a considerable stock and for which his machines had been adapted. After full and sympathetic inquiry it was decided that the specification must be adhered to. The manufacturer retaliated by saying that he would do as he had been ordered but that as he had enough work on hand without altering the settings of his machines, he could not get on with the new order for many months. The reply was short and sharp. The orders for the work on hand were cancelled, priorities for the new material only were granted and this somewhat recalcitrant manufacturer simply had to toe the line.

The "Cost Plus" Basis

The alternative general type of contract is the "time and material," "on cost" or "cost plus." The last title is the more interesting because of its incompleteness. Plus what? There are many different "plusses" each having its advantages and applications. Where there are so many possible systems of "plussing" there is an equally large opportunity of employing varying formulæ on which to base a contract, but it is proposed here to consider only the four most usual of these. Other modifications will be apparent, but they are mostly employed where extraordinary conditions prevail.

(1) *Cost plus an overall percentage.*—There can be little doubt but that this system is the one which lends itself the most readily to abuse and it is the one which is the most difficult to deal with from the point of view of the accountants on either side. In Canada it is seldom employed—certainly far less than in England—if one of the other systems can be adopted. Yet there are cases where it is almost the only system under which the manufacturer can receive fair treatment. This is particularly the case where a large amount of experimental work has to be done before production, where design is likely to be varied from time to time during production, and where the expenditure on designers, draughtsmen, etc., as well as the factory space and number of machines in use may be expected to vary considerably during the execution of the contract. It applies also to large repair jobs.

An interesting instance of the operation of this system has come to my attention. The problem was to produce a quantity of high-grade machines to form part of a vital and costly equipment for the armed forces. No detailed specification was available and obviously a cost-plus-overall system was the only possible method of pricing. Many experimental models were made and scrapped at varying stages of their development and a large sum of money had been expended before a single model was produced which appeared likely to be of use. Even then two specimens were sent across the Atlantic for further test and approval. The net result was that the firm in question now has at its disposal—no patents being involved—the benefit of all this national expenditure which has produced a well-nigh perfect machine. As the firm has world-wide connections and the machine is likely to have many post-war applications, it will have a long start over its competitors.

(2) *Cost plus a percentage on time and materials plus overheads at cost.*—This system is applicable particularly in cases where pressure of time or the absence of prior information on probable costs prevents a more precise original contract being entered into. Frequently it is used only in the initial stages of specially urgent orders and the information obtained during the examination of the costs of these is made use of to frame a more exact contract for the remainder.

Fixed Profits

(3) *Cost plus a fixed profit per unit* and (4) *Cost plus a lump sum profit* may be considered together. Both provide for payment of the exact cost of the article plus a fixed sum, but they differ in the manner in which this fixed sum is arranged.

Method (4) is used where the amount of work, or the quantity of goods, is fixed. If it were used for indefinite quantities, as in the case of many war contracts, penalty clauses would have to be introduced to cover cases of slacking on the part of manufacturers.

Method (3), on the contrary, is of special value where the order calls for not less than a stated quantity per day or week and is a continuing order until countermanded or terminated. It has the further advantage that it encourages both speed and economy on the part of the contractor. Any improvements which he may be able to make in the processes of manufacture will have the effect of simplifying and therefore speeding up production. The contractor will benefit by greater output and therefore larger profits and the Government will obtain the goods at a lower unit cost and in a shorter time.

COMMERCE and INDUSTRY

Building Construction Guide. Batteries in War.

Wartime Building Standards

TO provide a handy means of reference to the approved standards of wartime construction the Ministry of Works has issued "The Standard of Wartime Building" (Stationery Office, 9d.). This publication is a revised and amplified edition of the "Notes on Methods of Construction and Uses of Materials" issued by the Directorate of Constructional Design in February and July, 1942, and further embodies the main recommendations of the Committee on Building Materials Standardisation on the use of alternatives for controlled or virtually prohibited materials. The text of the economy memoranda issued by the Committee is reprinted in full in the appendix.

Under separate trade headings all methods of construction have been divided into two sections: (1) Prohibited without reference; and (2) permitted. Where use is required of materials or methods of construction prohibited without reference approval must be obtained through the Regional Licensing Officer, Ministry of Works, in the case of civil licence jobs, and the appropriate Government Department in other cases. Under Section P, which deals with electrical installation work, the only item of this kind is cutting away for conduits: cutting chases in walls, ceilings, etc., is "prohibited without reference" and surface work (holes only through walls, floors, etc.) is "permitted." A general note states that the cleat wiring system shall be generally adopted and cables shall not be run in conduit except in special cases. Publications listed for reference comprise the Recommended War Emergency Relaxations of the I.E.E. Regulations and five relevant British Standard Specifications (B.S.S. 1062-6/1942).

An Exide Exhibition

Very few people outside the industry realise the important part played by batteries in the war effort. To a lesser degree that is also true of many engaged within the industry and from observations made at the Exide battery works it became apparent that many workers had little idea of what kind of batteries they were making, in what armaments the batteries were employed, or what functions they performed. It was agreed by the management that some form of education was necessary, and, the loan of an Army hut having been obtained, it was decided to proceed with four exhibitions each lasting three weeks and covering the following subjects: Army, Royal Air Force, Royal Navy, Workers' Health. The first exhibition opened on April 19th, and an average of approximately 150 workers have visited it each day in their own time. The interest of the visitors is beyond question and the company felt that the cost and time spent have been fully justified. Each exhibition is divided into four sections: in the case of the Army these cover (a) tanks; (b) anti-aircraft; (c) field communications, and (d) transport. All interior lighting is by fluorescent tubular lamps. The stand fittings will remain for each exhibition, though each part is a separate unit and may be moved to different positions to vary the layout.

Tank display at an Exide exhibition

For the sake of economy in time and money, much material already in existence was used and will be used again for each subsequent exhibition.

"Mosquito" Aircraft

Described as the fastest operational aircraft in the world, the de Havilland "Mosquito" is the first modern all-wood machine to go into operational service. In a detailed description of the manufacture of the bomber version in *Aircraft Production*, reference is made to the use of electric heating for accelerating the setting of the cement used in the ply-wood spar assembly, which is done in large fixtures with sloped access platforms. The object is to avoid the bottleneck in production that would otherwise occur since no other work can be done on the spar during the setting period.

Direct application of the heat to the cement is not possible and the area to be treated varies considerably across the span of the spar. The scheme applied, in co-operation with the Northmet Power Co., is based on the use of sectional

heating panels of wood placed on the top of the spar web. Wire heating elements embedded in the bottom faces of the panels are connected to a plug socket at one end of the top face. Current is supplied from busbars carrying 40 A at 25 V and taken along the base of the fixture. Regulating resistances are inserted between the busbars and flexible connections to the panels. Thermostatic control within ±1½ deg. F. is obtained by means of a thermostat on the end of a spar section mounted on the control panel, and connected directly to the cement line, into which thermometers can be plugged also.

Water and Electrical Fires

A solid stream of water playing on live electrical equipment may carry currents that are dangerous to the holder of the nozzle. As little as 0·1A may be harmful, the *Electrical World* states; 0·05A is held to be the smallest amount for fatal results.

The safe distance for solid streams depends upon the voltage and the distance between the nozzle and the live apparatus and the following figures in ft. are given for a fresh-water jet with a maximum diameter of 1¼ in. at various voltages to earth; the figures in brackets give the equivalent distance for salt water :—1,100 V, 6 (25); 3,300 V, 15 (30); 6,600 V, 19 (30); 11,000 V, 20 (30); 22,000 V, 25 (30); 33,000 V, 30 (35); 60,000 V, 70; 150,000 V, 20. For voltages up to 600 there is usually no danger unless the nozzle is held very close to electrified metal.

Tests on certain types of spray nozzle showed that no dangerous current at 250 kV was conducted in one case at 10 ft. away with pressures above 20 lb. per sq. in. and in another at 14 ft. with 40 lb. per sq. in.

An Electric Bicycle

A few days ago we had an opportunity of inspecting an experimental electric bicycle which Mr. L. A. Frankel, of 134, Cranley

Mr. Frankel with his "Electrobike"

Gardens, Muswell Hill, N.10, has developed. A standard heavy-duty tradesman's bicycle with 16-in. front wheel and 26-in. rear wheel is employed with a 12-V motor developing ¼ to ½ HP driving the rear wheel through a gear and chain system with a free-wheel device to permit normal pedalling. Two 6-V, 60-Ah batteries are mounted in the tradesman's receptacle over the front wheel, the weight of the batteries (80 lb) and motor (30 lb.) thereby being evenly distributed over the framework. Speed regulation is achieved by means of a rheostat and besides a "dead man's handle" there is a further safety feature in the form of a main control switch with a locking device.

Mr. Frankel claims that the "Electrobike," as the vehicle is called, will run 30 miles per charge on level road. The present model is geared specially for use in hilly districts and consequently has a maximum speed of only about 16 miles per hour. In the improved model which the inventor proposes to produce after the war, a three-speed hub will be incorporated and the batteries will be slung under the front portion of the frame, probably one above the other so as to allow for a 26-in. wheel to be employed in the front of the machine.

Aid for Russia

During the first four months of 1943 the Red Cross Penny-a-Week Fund transferred £300,000 from its revenue to Mrs. Churchill's Red Cross Aid to Russia Fund. By the end of May £375,000 will have been so transferred. It will be remembered that in a New Year broadcast announcement Mrs. Churchill said it had been decided that while the need was urgent one-quarter of all contributions to the Penny-a-Week Fund would be devoted to medical aid to Russia through the Red Cross fund which bears her name. The response of the Penny-a-Week Fund's 12 million contributors to this appeal has so far exceeded expectations. Nevertheless, as Mrs. Churchill has pointed out, the Aid to Russia Fund is already overspent, and a great deal more money is required. Recently a further £500,000 was allocated by the Red Cross and St. John for the purchase of additional supplies for our Russian allies. Over 3,000 tons of material and equipment have already been shipped to Russia.

Holidays With Pay

For some time past the Electrical Contractors' Association has been dealing with questions from its members on the subject of holidays with pay. Now the Director of the Association (Mr. L. C. Penwill) has sent the members particulars of a new scheme worked out jointly by representatives of employers and operatives in the electrical contracting industry and the heating, ventilating and domestic engineering industry.

The "Specialist Trades Holiday Scheme" will be operated by a non-profit-earning company under the direction of a board composed of representatives of the organisations who are parties to the agreements covering the wages and conditions to be observed in the industries concerned. The scheme necessitates the affixing of a stamp, 1s. 6d. in value, to a holiday credit card. The approved card and stamps can be obtained only from 21, Tothill Street, London, S.W.1. The first holiday payment to the operative will take place in 1944, and in order to give the value of the full year's credit it has been agreed to make the scheme effective

as from May 31st, 1943, which date is the commencement of the first week for which the card will be stamped.

A copy of the detailed scheme will be issued in due course, but in view of the early date of operation application for the requisite number of cards and a supply of stamps should be made at once. The cards and the stamps will be distributed immediately they are available, but it is stated that owing to paper control difficulties there may be a little delay before they are despatched.

The industries having agreed through their recognised negotiating machinery on a holidays with pay scheme it will be regarded as a condition of employment within the industries and therefore all employers, whether members of the relative employers' associations or not, should utilise the scheme in order to meet their obligation for the provision of holidays with pay to all adult operatives whose wages and working conditions are determined by the National Industrial Joint Council for the Electrical Contracting Industry or the Four Part Conference for the Heating, Ventilating and Domestic Engineering Industry. Inquiries regarding the scheme should be addressed to the appropriate association.

Double Squirrel Cage Motors

The latest price list (C.44) announced by Newman Motors deals with fan-cooled machines rated at from 5 HP at 480 RPM to 25 HP at 1,460 RPM, and designed with double squirrel cage rotors as standard after careful consideration between that type and the slip-ring variety. (Under S.R.& O. 1941, No. 1864, undertakings may not refuse to supply electricity for operating squirrel-cage motors up to 30 HP, on three-phase systems.) Double-cage machines are stated to develop starting torques ranging from 70 per cent. in the case of 12-pole windings to 150 per cent. in the case of 4-pole windings when used with star-delta starters, the starting current ranging from 120 per cent. in the case of 12-pole windings to 200 per cent. in the case of 4-pole windings.

The foregoing performances are said to be roughly equivalent to those of slip-ring motors, but the double-cage construction is claimed to enable more reliable machines to be offered at more attractive prices. They are all totally enclosed, showing that the company has not changed its conviction that all motors should be so constructed. On the inside back cover of the booklet there is a simplified version of the Control of Industrial Electrical Equipment (No. 1) Order, 1943.

Australian News

Our Perth correspondent reports: Electrical traders are finding some difficulty in doing business these days owing to shortage of stocks. Seasonal changes which continue to bring forth inquiries make little difference to trade, as many lines cannot be secured at any price. Several traders are turning their attention these days to the sale of second-hand goods, when these can be secured. Shortage of assistants is another problem which steadily grows worse, and special permission was given over the Christmas holidays to employ juveniles of school age. All other employees now have to be secured through Government channels.

An Electricity Generator and Engine Investigation Order has recently been put into force under which all electricity generators and engines have to be registered.

Regulations prohibiting the use of electricity in shop windows and limiting the amount used in places where goods are exposed for retail sale were recently gazetted in Canberra. The regulations state that no person shall use any electricity in any shop front, shop window, display window, showcase or advertising sign or fitting. Not more than one watt per sq. ft. of floor area shall be used in any place where goods are exposed for sale by retail.

As these notes are being written about 300 men have gone on strike at the Sydney County Council's Bunnerong power station because of a dispute about a leading hand. A conference has been convened by the President of the Industrial Commission.

Change of Address

The Manchester branch of the Brush Electrical Engineering Co. Ltd., Petters Ltd., and Brush Coachwork, Ltd., has been removed from Daimler House, Wilmslow Road, Rusholme, to Yorkshire House, 45, Cross Street, Manchester, 2.

TRADE MARK APPLICATIONS

THE following applications have been made for British trade marks. Objections may be entered within a month of May 26th:—

WESTERN ELECTRIC. No. 608,724. Class 9. All electrical goods included in Class 9.—Western Electric Co., Inc., 195, Broadway, New York, U.S.A. Address for service is c/o F. C. Tomlins, 152, Coles Green Road, Cricklewood, London, N.W.2. To be associated with No. 503,170 (2679) viii.

WAVOX. No. 622,717. Class 9. Wireless capacity aerials.—Frederick Driver, trading as Appliance Productions, 375, Waterloo Road, Manchester, 8.

DURACLAD. No. 622,457. Class 17. Insulating material and electric insulation parts.—Duratube & Wire, Ltd., 16, Hanworth Road, Feltham, Middlesex. To be associated with No. 617,545 (3343) xvii and others.

INFORMATION DEPARTMENT

GENERAL inquiries from readers relating to sources of electrical goods, makers' addresses, etc., are replied to by our Information Department through the post. Inquiries should be accompanied by a stamped addressed envelope.

Our extensive records enable us to reply to most queries, but occasionally we ask for our readers' assistance in tracing names and addresses not known to us. We should be glad to have such information regarding the following:—

Present address of the Standard Ozone Co., Ltd. ("Ultrozone"), formerly of Haymarket, S.W.1.

Highlands Water Power

Bill Passes Third Reading

ON May 27th the Hydro-Electric Development (Scotland) Bill passed its final stages in the Commons and was read a first time in the Lords.

But it did not leave the Commons without severe criticism. Sir Arnold Gridley said that the Bill was still a bad one, much as it had been improved. It still remained a very bureaucratic measure. Under it the Electricity Commissioners were given far wider powers than Parliament had ever previously granted them. There were no fewer than ten circumstances under the Bill in which full authority was left to the Commissioners to make decisions. In six out of the ten they had complete powers and there was no appeal. In common justice there should be a right of appeal from their decision.

The Commissioners were empowered to decide whether the Board or the power company should supply in bulk to an authorised undertaker inside a power company's area. They had to approve development schemes and construction schemes; and they were also empowered to approve distribution schemes. They could decide what tariffs should be charged, and how capital should be raised and on what terms. They could also say whether the Board might acquire undertakings inside the area of any power company, thus conflicting with the latter's rights conferred on it by Parliament. They might also decide the terms on which transmission lines belonging to others might be jointly used, and though there might be a genuine difference of opinion between the two bodies, once again there was no appeal. Finally, under Clause 20, they might decide what economies had been secured by an undertaking taking supplies in bulk from the Board and how that economy should be passed on to the consumers.

Increased Construction Costs

Sir Arnold said that it was most unlikely that the scheme would become operative for five or six years. It would be constructed at a time when civil engineering costs must inevitably be considerably higher than if this scheme had been allowed to proceed in the pre-war years when it was invariably turned down by the House. Therefore, the time when income and outgoings would balance might be nine or ten years hence. That did not necessarily mean that the scheme should not be proceeded with, but the time would come when some of the original construction cost, because it was more than it would be in normal times, might have to be written down.

Professor Gruffydd protested that there was no provision in the Bill for dealing with the profits of concerns which came to Scotland because they were attracted by cheaper electricity. At the same time, the one undertaking which was designed to serve the public interest in the matter of electric power, the grid, was compelled by Clause 16 to buy all the electricity that the Hydro-Electric Board prescribed at a very enhanced rate, the top price of steam-generated power in Scotland. So industries, in Scotland and elsewhere, drawing their power from the grid would necessarily be unable to compete with the new favoured industries in this area.

Large and Small Consumers

Sir Murdoch MacDonald, supporting the Bill, admitted that large concerns like the carbide producing companies might possibly take advantage of it, but smaller normal users would make use of it only if they could get some advantage to compensate them for the additional transport to the Highlands and back again to the centres of population where their goods would be distributed. Was it not desirable that industries should be spread as widely as possible throughout the country? It was obvious that the Clause which gave the Board the power to supply electricity at the rate at which the steam-generating station could produce it was a right and justifiable suggestion. Any excess profit in the production of the Board's own power from water had to be used in the area itself.

Major Lloyd described the Bill as a great experiment, but he thought it a pity if expectations were raised too high. They should not run away with the idea that the mere provision of this electricity would cause a rush of industries to the Highlands. He was not yet entirely convinced that the Board would be able to supply cheap electricity, as its profits were really dependent on the results of its supplies to the Central Electricity Board.

After further debate, Mr. Johnston, the Secretary of State for Scotland, said that the Bill was only an instalment in the planning and utilisation of the energies and resources of the Highlands. Nobody was more conscious than he that the Bill was not perfect. He and the Lord Advocate had had to compromise time after time because they wanted a Bill that would work. The members of the Government responsible for the composition of the Board would take the utmost care to ensure that the Board would be such as to carry the confidence of the people of Scotland.

Fuel Policy

Select Committee's Report. A National Programme.

THE latest report (Stationery Office, 2d.) of the House of Commons Select Committee on National Expenditure contains a warning that in the absence of new conditions, such as the release of more miners from the Services or their transfer from other industries, the country must be prepared to face a dangerous decline in coal production next autumn and winter. The need for economy is therefore considered imperative.

The Committee expresses the view that the voluntary fuel economy campaign has been most successful and must be continued without a break. Further economies can be achieved by some industrial users. It is suggested that as little raw coal as possible should be used for domestic purposes and that when there is a choice gas should be used in preference to electricity because its by-products are needed to make munitions. Slot meter consumers should be urged to greater economy.

With regard to the mining of coal, the Committee considers that the attention of miners should be directed to justifiable complaints about the amount of stone and dirt in coal, and that their aid should be sought in devising a remedy. Coal-getting machines of a comparatively novel type in this country are not likely to be in operation in effective numbers before next autumn, and the Committee is not satisfied that they will accomplish what their advocates claim.

Complete Processing Advocated

A return to prosperity through complete utilisation of all coal produced annually was visualised by Mr. W. Wakefield Adam, M.I.Mech.E., in an address to the Institute of Export last week in London.

He pointed out that in 1938 out of a total of 227 million tons of coal mined, 187 million tons was burned in a raw state, the pithead price being £1 per ton. Processed coal had a net value of approximately 2½ times the raw value, therefore out of the total burned the net value of the derivatives which were destroyed in 1938 was about £280 million. In addition, the complete processing of all coal would eliminate smoke and soot, which damaged the surface of buildings to such an extent that the annual cost of repairs due to this was more than £50 million. Adding these together the saving would amount to £330 million annually, not to speak of a further possible £50 million which the processing of coal would provide in wages throughout the various industries concerned.

More than half of the raw coal was used for domestic, factory and other purposes. Housewives should be taught to use smokeless fuel. Factories should not be allowed to use raw coal unless in very large power plants where the coal could be processed. In 1938 nearly 40 million tons of raw coal was exported. It would be more remunerative to export derivatives.

All available hydro-electric power should be utilised, 650,000 kW approximately, together with a further possible 500,000 kW from gas obtained by the underground gasification of abandoned coal mines, making a total of 1,150,000 kW continuously and saving 2,500,000 tons of coal annually, the net value of which, if processed, would be approximately £6¼ million.

Further power could be produced by organised collaboration between the gas and electricity industries under which the gas industry would process the coal. The gas produced might be used in gas turbines driving alternators and the coke could be used in boilers for steam-driven alternators.

Electrification of coal mining plant would save coal to the extent of at least 8,000,000 tons annually, which if processed would have a net value of £20 million. The capital cost of the transformation would be about £65 million.

Electrification of railways would save approximately £17 million per annum, and it was estimated that in a few year's time the annual coal saving would increase to 9,750,000 tons per annum, the net value of which, if processed, would be more than £24 million. These savings would assist the financing of the electrification, which was estimated to cost about £261 million.

Importance of Statistics

The principal thesis presented in a paper prepared by Mr. O. W. Roskill for the Institute of Fuel is that national fuel policy must be approached, first, from the point of view of consumption, ensuring that the fuel best suited to any particular purpose shall be utilised for that purpose; secondly, from the point of view of national resources, assurance of optimum use.

The author contends that economic research, of which statistics are the basic facts and statistical methods the tools, must go before and with, as well as after, scientifically technical research. He points to the benefits of improved statistical knowledge of the electricity supply industry that public control has brought about, but complains that even in this instance consumption data are sadly lacking. In an attempt briefly to survey figures available in this country he places electricity undertakings (9·37 million tons in 1930 and 11·93 million in 1935) fourth in a list of coal consuming industries. There are similar lists of coke consuming industries and trades utilising heavy oil fuel, together with a table showing the quantities of electricity supplied for lighting, heating, cooking, traction and power with a sub-division of energy consumed for power purposes by different trades.

A sample investigation of weekly expenditure (pre-war compared with 1942) on fuel per household in Yorkshire is included, while the estimated consumption of different kinds of fuel and electricity in a variety of trades in 1935 is tabulated in an appendix to the paper. The author believes that economic and industrial history can yield information of really practical value, but that is not his immediate object. His endeavour is to show that such figures as he has compiled are wanted regularly to indicate trends; in more detail because statistics which are so general as to mean anything can be used to prove anything; and speedily because figures are the fingerposts of policy and they must be kept clearly legible.

ELECTRICITY SUPPLY

Hackney Supports J.E.A. Zambesi Power Scheme.

Amble (Northumberland).—ELECTRICAL REPAIRS.—The Urban District Council has agreed to a recommendation by the Electricity Committee that, as a wartime measure, the Electricity Department should carry out electrical repairs for consumers and make a charge which would not compete with electrical contractors. It has been agreed that the Department should only carry out such work if the services of a contractor were not available.

Glasgow.—EXTENSIONS TO MAINS.—The Corporation Electricity Committee has approved of ordinary and special extensions of distributing mains being laid at a cost of £123 and £1,272 respectively.

Guildford.—COMPENSATION FOR INCREASED COSTS.—The Electricity Committee reports that the Central Electricity Board has agreed to grant £518 compensation for increased running costs by reason of spasmodic working at the generating station due to the requirements of the Board.

London.—WATERWORKS ALTERATIONS. — The Metropolitan Water Board is to remodel lighting, heating and auxiliary power at the Kew Bridge works at a cost of £1,700 and the electric and auxiliary power services at the Lee Bridge works (£950). Electric lighting and power are to be provided at the Nunhead works of the Board (£1,050).

WARTIME STREET LIGHTING.—The Works Committee of Southwark Borough Council has reported that it cannot recommend the adoption of any form of wartime street lighting at the present time. It adds that in its opinion street lighting in London during wartime should be the subject of a standard scheme for the whole metropolis. Motor drivers, the report states, hold that "starlighting" has distinct disadvantages when it abruptly ceases on the borders of a local authority area.

BATTERY RENEWAL.—Southwark Emergency Committee reports that a large number of batteries for emergency lighting in public shelters require renewal. The cost is estimated at £626.

SUPPORT FOR J.E.A.'S PROPOSALS.—Hackney Electricity Committee, having considered the reorganisation and development scheme of the London and Home Counties J.E.A., has expressed the opinion that the proposals should be agreed to. In arriving at this conclusion note has been taken of the present development of the distribution side of the industry; the unwarrantable inequalities in tariffs and services in different areas; and the benefits which have resulted from the establishment of a central generation authority. As regards such ancillary questions as terms of acquisition the Committee feels that, once the main principle has been settled, these can be dealt with by legislation at a later date.

Portland.—LIGHTING AND HEALTH.—The opinion that the bad lighting of a report centre was largely responsible for the considerable degree of sickness among the whole-time personnel was expressed recently by the medical officer of health, who recommended that fluorescent tubes be installed in the switchboard room. The Emergency Committee of the U.D.C. approved the proposal.

Overseas

Canada.—SILVER REPLACES COPPER.—The United States is making available quantities of silver for use in place of copper as an electrical conductor and a Bill has been introduced in the Quebec Legislative Assembly to provide exemption from increases in taxation because of such use of silver.

Eire.—REPLY TO CRITICISM OF RATIONING SYSTEM.—Since April each electricity consumer has been in possession of a card showing the number of kWh used in 1941, the basic period for the rationing system. Writing in the *Irish Times* recently, Mr. E. D. Moore pointed out that in the summer of 1941 consumers were asked to keep the amount of electricity used down to the minimum. Consequently those who displayed civic spirit then were now being penalised. He suggested that the ration should be based on the size of the house and the number of occupants. To this Mr. E. A. Lawler, of the E.S.B. Public Relations Department, replied that the allegation that consumers who tried to assist in 1941 by reducing their consumption of electricity were being penalised was without foundation. The Board had a complete record of the consumption of electricity by each consumer for many years back and consulted these records when any such complaint arose. In the case of Mr. Moore, in the period May to August, 1940, his record showed a consumption of 987 kWh, whereas in the same period in 1941 his consumption was 1,429 kWh. In general the consumption of domestic electricity in the summer of 1941 was some 30 per cent. higher than in 1940. The method of restricting the use of electricity adopted by the Board had the advantage of simplicity and minimum interference with the individual consumer, and avoided the setting up of a huge and expensive organisation.

Southern Rhodesia.—KARIBA DAM PROJECT.—Among post-war development plans being investigated by the Southern Rhodesian Government is a scheme for building a dam in the Kariba Gorge for a hydro-electric plant to provide cheap power over a large area of the Colony. The engineer, Mr. J. L. S. Jeffares, who has made preliminary investigations on behalf of the Government, states that although the Kariba Gorge scheme would cost only a fraction of the £14 million involved in building the famous Colorado Dam in the United States, the Kariba Dam would be much larger. The scheme involves damming the Zambesi, the annual discharge of which is about twice that of the Colorado. The result would be an enormous area of water at low cost and the irrigation of 100,000 acres of land would take only a fraction of the total volume of water available. The dam would be situated at a point about 200 miles below the Victoria Falls.

FINANCIAL SECTION

Company News. Stock Exchange Activities.

Reports and Dividends

The West London & Provincial Electric & General Trust, Ltd., reports a net income for the year ended March 31st (after deducting income tax) of £15,442, as compared with £15,216 for 1941-42. After debiting charges shown in the accounts, there is a balance of £10,553, to which is added £3,918 brought in, making a total of £14,471. The final ordinary dividend is 3½ per cent., again making 5½ per cent. for the year. The balance carried forward is £4,011.

Ransomes & Rapier, Ltd., report a trading profit for 1942 of £195,798, as compared with £219,363 for the preceding year, and a net profit of £26,008 (against £19,938). Reserve receives £5,000 and war damage payment requires £2,292. The final ordinary dividend is 4 per cent., making 6 per cent. tax free for the year (against 5 per cent. net). The balance carried forward is £3,483 (against £1,117 brought in).

The London Electric Wire Co. & Smiths, Ltd., is paying a final ordinary dividend of 5½ per cent., maintaining distribution for the year at 7½ per cent. and is also paying an interim dividend of 2 per cent. for 1943 (unchanged).

Crompton Parkinson, Ltd., have declared an interim dividend at the rate of 7½ per cent. actual on the ordinary and "A" ordinary stock in respect of the year ending September 30th, 1943.

Siemens Bros. & Co., Ltd., have announced a first and final dividend of 7½ per cent., less tax, for 1942. A similar distribution was made for 1941.

Edmundsons Electricity Corporation, Ltd., proposes to pay a final dividend on the ordinary stock of 3½ per cent., maintaining the distribution for the year at 6 per cent., less tax.

Venner Time Switches, Ltd., report a considerable improvement during the past year; the profit rose from £28,503 to £75,593, enabling the company to declare an ordinary dividend of 15 per cent., against nil for the preceding year.

The B.E.T. Electricity Supply Co., Ltd., has declared a dividend of 5 per cent. for the past year, against 4 per cent.

Johnson, Matthey & Co., Ltd., announce a final dividend of 3 per cent. and a bonus of 4 per cent., again making 10 per cent. for the year.

The National Electric Construction Co., Ltd., has announced a first and final dividend of 10 per cent.

New Companies

M. Sinclair & Co., Ltd.—Private company. Registered May 20th. Capital, £1,000. Objects: To carry on the business of electrical, heating, ventilating, refrigerating, cold storage and general engineers, manufacturers of, and dealers in, wireless and television sets, etc. Directors: M. Sinclair and A. Sinclair, both of 51, Manchester Road, Lostock Graham, Northwich, Ches. Registered office: 57, Witton Street, Northwich.

Parkes & Upperton, Ltd.—Private company. Registered May 15th. Capital, £1,000. Objects: To carry on the business of manufacturers and repairers of, and dealers in, wireless sets, gramophones, electrical engineers, etc. Directors: E. Burkett and J. E. Shelton, both of 111, Church Road, Hove, and two others. Registered office: 111, Church Road, Hove, Sussex.

Companies' Returns

Statements of Capital

Drake & Gorham, Ltd.—Capital, £125,000 in £1 shares. Return dated December 8th. All shares taken up. £85,000 paid. £40,000 considered as paid. Mortgages and charges: £37,288 debenture stock.

Bush Radio, Ltd.—Capital, £80,000 in 5s. shares. Return dated December 8th. 320,000 shares taken up. £80,000 paid. Mortgages and charges: £61,450 5s. 2d.

Tolworth Electricity Co., Ltd.—Capital, £1,000 in £1 shares. Return dated December 10th. All shares taken up. £501 paid (£1 on 2 shares and 10s. on 998 shares). Mortgages and charges: Nil.

Touring Electric Signs, Ltd.—Capital, £100 in 2s. shares. Return dated December 31st. 600 shares taken up. £60 considered as paid. Mortgages and charges: Nil.

B. French, Ltd.—Capital, £5,000 in £1 shares. Return dated January 14th, 1943. 4,755 shares taken up. £4,755 paid. Mortgages and charges: Nil.

Increases of Capital

Electrical & Refrigeration Services, Ltd.—The nominal capital has been increased by the addition of £2,900 in £1 ordinary shares beyond the registered capital of £100.

Lonsdale & Company (Electric), Ltd.—The nominal capital has been increased by the addition of £900 in £1 ordinary shares beyond the registered capital of £100.

Mortgages and Charges

Guy R. Fountain, Ltd.—Land Registry Charge on land at West Norwood, dated April 24, 1943, to secure £5,000. Holder: Mrs. Elsie M. Fountain, Tudor Lodge, 112, College Road, Dulwich, S.E.21.

Brooks & Bohm (Dry Batteries), Ltd.—Debenture dated May 17th, 1943, to secure £1,500, charged on the company's undertaking and assets. Holder: Adalbert Braun, 320-321, Regent Street, London.

F. H. Hellyar, Ltd.—Assignment on May 8th, 1943, of proceeds of contracts, to secure all moneys due or to become due from the company to Barclays Bank, Ltd.

Modern Telephone Co., Ltd.—Satisfaction in full on May 13th, 1943, of debenture dated March 12th, and registered April 2nd, 1941.

Bankruptcy

J. Cameroff, electrical engineer, 43, Camp Road, Leeds.—Last day for receiving proofs for dividend June 11th. Trustee, Mr. H. C. Bowling, 24A, Bond Street, Leeds, Official Receiver.

STOCKS AND SHARES

TUESDAY EVENING.

THE month of June is not usually associated with Stock Exchange activity in any marked degree, and at the moment it would appear likely that the present month will do nothing to belie the tradition established by experience of the past. It is true that another week or two will see the conclusion of the "Wings for Victory" campaign which has been spread over the country and which has directed so much money into war securities. By degrees, the Stock Exchange markets for such gilt-edged securities as suffer by the competition of the War Loans are re-assuming a more cheerful complexion. Of the abundance of money available for employment there is less evidence now, of course, than prevailed before the "Wings" weeks started. Nevertheless, the disposition of purely investment stocks is to harden, and the recent dullness in Home Railways, more especially those stocks in the senior class, is attracting the notice of prospective buyers. The financial position would appear to remain in the nature of a "one-way street," prices, with occasional setbacks, being consistently raised under the pressure of a demand to which there seems no end.

Calcutta Shares Rise

A rise of 3s. in Calcutta Trams has taken the shares to 36s. 3d. Calcutta Electric Supply are 1s. up at 35s. The rise in Palestine Electric "A" shares tempted selling, and the shares fell back to 41s. 3d., but Jerusalem Electrics have put on 1s. 6d. at 27s. 6d. Nothing seems to stop the absorption of Victoria Falls Power ordinary, the price of which has now reached 83s. 9d. Home electricity shares show no changes of any consequence. Electric Finance & Securities rose 1s. upon repetition of the previously-paid 12½ per cent. dividend for the year. County of London and Isle of Thanet are both 6d. up. Bournemouth & Poole fell 1s. to 51s. 6d. Midland County 6d. to 38s. The market on the whole is quiet and, for the time being, is somewhat uninteresting.

Cable & Wireless

Cable & Wireless ordinary stock has risen 2½ to 82½, the highest price touched for six years. (It may be of interest to mention that the price just before the outbreak of war was 49.) The dividend announcement is expected to be made on Tuesday or Wednesday next week. A month or so back the more optimistic had been talking largely of a possible 5 or even 6 per cent. dividend on the ordinary stock and, as the current price shows, there is still a hope of a 5 per cent. dividend. The cautious, however, take the view that under present conditions the combine is not likely to exceed the previous 4 per cent. and, if this latter rate is declared, though it may disappoint the more hopeful folk, it will satisfy those who contend that the stock is worth the present price from the point of view not so much of current yield as that of post-war prospects.

Radio

During the last few business days renewed demand sprang up for A. C. Cossor shares, and the price rose 1s. to 22s. This was accompanied by more rumours of the expected amalgamation of the company with some other in the same sphere of business. E.M.I. shares remain dull at 23s. 6d. Apart from the business in Cossor shares, the speculation of a month ago in the radio group has given place to a quieter state of affairs.

Miscellaneous Matters

Out of its trading profit of £213,000 for 1942, Walsall Conduits has to provide £133,600 for taxation. The balance enables the ordinary dividend of 55 per cent., demanding £41,250 to be comfortably met, and the carry-forward of £86,195 is about £3,000 more than that of last year. The 4s. shares are quoted ex dividend at 44s., yielding at that price 5 per cent. on the money. Brush Electrical ordinary give a similar return at 8s., the price being a few pence lower on the week. A block of Brush shares is held by Associated British Engineering—formerly Petters, Ltd.—and the recent raising of the Brush dividend has enabled Associated British Engineering to advance its distribution from 5 to 6 per cent. Upon this, the ordinary hardened to 21s. 6d. x.d. The 5½ per cent. preference stand at 20s. Allen West have gone back to 7s. Siemens were unaffected by the dividend announcement. Renewed demand for Ensign Lamps caused a rise in the price to 22s. 6d. Telephone shares are a trifle easier. Automatics at 59s. are down 1s. and Telephone Properties at 13s. 9d. have lost threepence. Marconi Marines are unaltered at 33s.

Debenture Stocks

Modest though the yield it affords, County of London Electric Supply 3¼ per cent. debenture is so amply secured that it may be of service to mention £7,000 stock as being on offer in the market at 101½, ex the interest payment due to-day, June 1st. The annual interest service of £377,200 is covered by over £2,000,000 sterling in the last-issued report. The stock is redeemable at 100 in 1972, but the company has the option to pay it off after September, 1952, also at 100. The flat yield is £3 4s. per cent., this making no allowance for possible loss on redemption.

(*Continued on page* 766)

ELECTRICAL INVESTMENTS

Prices, Dividends and Yields

Company	Dividend Previous	Dividend Last	Middle Price June 1	Rise or Fall	Yield p.c. £ s. d.
Home Electricity Companies					
Bournemouth and Poole	12½	12½	56/6	−1/−	4 6 10
British Power and Light	6	7	31/−	..	4 10 4
City of London	7	7	30/−	..	4 13 4
Clyde Valley	8	8	39/−	..	4 2 0
County of London	8	8	39/−	+6d.	4 2 0
Edmundson's:					
7% Pref.	7	7	34/−	..	4 2 4
Ord.	6	6	29/−	..	4 2 9
Elec.Dis.Yorkshire	9	9	44/6	..	4 1 0
Elec. Fin. and Securities	12½	12½	52/−	+1/−	4 16 1
Elec. Supply Corporation	10	10	46/6	..	4 6 0
Isle of Thanet	2	Nil	16/6	+6d.	—
Lancs. Light and Power	7½	7½	35/−	..	4 5 9
Llanelly Elec.	5½	6	26/	..	4 12 4
Lond.Assoc.Electric	4	3	22/−	..	2 14 10
London Electric	6	6	26/6	..	4 10 7
London Power Red. Deb.	5	5	104½	..	4 15 7
Metropolitan E.S.	8	8	38/6	..	4 3 2
Midland Counties	8	8	38/−	−6d.	4 4 2
Mid. Elec. Power	9	9	43/−	..	4 3 9
Newcastle Elec...	7	7	31/−	..	4 10 5
North Eastern Elec. Ordinary	7	7	32/−	..	4 7 6
7% Pref.	7	7	34/−	..	4 2 4
Northampton	10	10	47/6	..	4 4 0
Notting Hill 6% Pref. (£10)	6	Nil	9¾	..	—
Northmet Power: Ordinary	7	7	36/6	..	3 16 8
6% Pref.	6	6	31/−	..	3 17 5
Richmond Elec.	6	6	26/−	..	4 12 4
Scottish Power	8	8	37/6	..	4 5 4
Southern Areas	5	5	22/6	..	4 9 0
South London	7	7	26/−	..	5 7 8
West Devon	5	5	23/−	..	4 7 0
West Glos.	4½	3½	23/−	..	3 0 10
Yorkshire Elec.	8	8	40/−	..	4 0 0
Overseas Electricity Companies					
Atlas Elec.	Nil	Nil	5/3	..	—
Calcutta Elec.	7*	6*	35/−	+1/−	3 8 7
Cawnpore Elec.	10	10	30/−	..	6 13 4
East African Power	7	7	32/−	..	4 7 6
Jerusalem Elec.	7	5	27/6	+1/6	3 12 9
Kalgoorlie (10/−)	7½	5	9/−	..	5 11 1
Madras Elec.	6*	4*	24/−	..	—
Montreal Power	1½	1½	27½	..	5 7 2
PalestineElec."A"	Nil	4*	41/3	−1/−	1 18 9
Perak Hydro-elec.	6	7	9/−	..	—
Shawinigan Power	83cts.	90cts.	19½	+½	—
Tokyo Elec. 6%	6	6	19	..	—
VictoriaFallsPower	15	15	4¼	+⅛	3 11 9
WhitehallInv.Pref.	—	—	25/−	..	4 16 1

Company	Dividend Previous	Dividend Last	Middle Price June 1	Rise or Fall	Yield p.c. £ s. d.
Public Boards					
Central Electricity:					
1955-60 (Civil Defence)	—	3	100	..	3 0 0
1955–75	5	5	115	..	4 7 0
1951-73	4½	4½	109	..	4 2 7
1963–93	3½	3½	103½	..	3 7 8
1974–94	3½	3½	101	..	3 3 9
LondonElec.Trans. Ltd.	2½	2½	96½	..	2 11 10
London & Home Counties 1955–75	4½	4½	111	..	4 1 1
Lond.Pass.Trans.:					
A	4½	4½	117½	−1	3 16 7
B	5	5	117½	..	4 5 1
C	2½	3	61½	..	4 17 7
WestMidlandsJ.E.A. 1948–68	5	5	110	..	4 11 0
Telegraph and Telephone					
Anglo-Am. Tel.:					
Pref.	6	6	113½	..	5 5 9
Def.	1½	1½	28	..	5 7 2
Anglo-Portuguese	8	8	24/6	..	6 10 7
Cable & Wireless:					
5½ Pref.	5½	5½	112	..	4 17 9
Ord.	4	4	82½	+2½	4 17 0
CanadianMarconi $1	Nil	4cts.	10/−	+3d.	—
Globe Tel. & Tel.:					
Ord.	8½*	5*	35/−	..	2 17 2
Pref.	6	6	29/3	..	4 2 3
GreatNorthernTel. (£10)	Nil	Nil	23½	..	—
Inter. Tel. & Tel.	Nil	Nil	18	−½	—
Marconi-Marine	7½	7½	33/−	..	4 11 0
Oriental Tel. Ord.	16	10	37/6	+6d.	—
Telephone Props.	6	Nil	13/9	−3d.	—
Tele. Rentals (5/−)	10	10	11/3	..	4 9 0
Traction and Transport					
Anglo-Arg. Trans.:					
First Pref. (£5)	Nil	Nil	5/−	..	—
4% Inc.	Nil	Nil	13	..	—
Brit.Elec.Traction:					
Def. Ord.	45	45	1095	..	4 2 2
Pref. Ord.	8	8	170	..	4 14 2
Bristol Trams	10	10	51/−	..	3 18 6
Brazil Traction	$½	$1	32½	+1	—
Calcutta Trams	8	5½	36/3	+3/−	3 0 6
Cape Elec. Trams	5	6	25/−	..	4 16 0
Lancs. Transport	10	10	44/3	..	4 10 4
Mexican Light 1st Bonds	5	5	104	+2½	4 16 2
Rio 5% Bonds	5	5	104½	..	4 15 9
Southern Rly.:					
5% Prefd.	5	5	76	..	6 11 6
5% Pref.	5	5	112	−½	4 9 3
T. Tilling	10	10	53/3	..	3 14 5
West Riding	10	10	43/−	..	4 13 0

(*Continued on next page*)

* Dividends are paid free of Income Tax.

Company	Dividend Previous	Dividend Last	Middle Price June 1	Rise or Fall	Yield p.c.
Equipment and Manufacturing					£ s. d.
Aron Elec. Ord...	7½	10	41/3	..	4 17 0
Assoc. Elec. :					
Ord.	10	10	50/–	..	4 0 0
Pref.	8	8	40/–	..	4 0 0
AutomaticTel.&Tel.	12½	12½	59/–	–1/–	4 4 9
Babcock & Wilcox	11	11	48/9	–1/–	4 10 3
British Aluminium	10	10	50/–	..	4 0 0
British Insul. Ord.	20	20	5½	..	3 14 6
British Thermostat (5/–)	18½	18½	17/6	..	5 5 9
British Vac.Cleaner (5/–)	10	15	24/3	..	3 1 10
Brush Ord. (5/–)	6	8	8/–	–3d.	5 0 0
Burco (5/–) ..	15	15	14/3	..	5 5 1
Callender's ..	15	15	82/–	..	3 13 0
ChlorideElec.Storage	15	15	82/6	..	3 12 8
Cole, E. K. (5/–)	7	10	21/6	–6d.	2 6 6
Consolidated Signal	17	24	5 5/8	..	4 6 0
Cossor, A. C. (5/–)	15	10*	22/–	+1/–	3 8 4
Crabtree (10/–) ..	17½	17½	37/6	..	4 13 4
Crompton Parkinson Ord. (5/–) ..	20	20	25/–	..	4 0 0
E.M.I. (10/–) ..	6	6	23/6	..	2 11 0
Elec. Construction	10	10	44/–	..	4 11 0
Enfield Cable Ord.	12½	12½	55/–	..	4 11 0
Elecl. Switchgear (10/–)	10	10	20/–	..	5 0 0
English Electric	10	10	48/–	..	4 3 4
Ensign Lamps(5/–)	25	25	22/6	+ 1/8	5 11 1
Ericsson Tel.(5/–)	22†	20†	47/6	..	2 2 2
Ever Ready (5/–)	40	40	37/6	..	5 6 8
Falk Stadelmann	7½	7½	30/6	..	4 18 4
Ferranti Pref. ..	7	7	28/9	..	4 17 5

* 5 per cent. tax-free.

Company	Dividend Previous	Dividend Last	Middle Price June 1	Rise or Fall	Yield p.c.
					£ s. d.
G.E.C.: Pref. ..	6½	6½	33/9	–6d.	3 17 0
,, Ord. ..	17½	17½	89/–	..	3 18 8
Greenwood&Batley	15	15	39/–	..	7 13 10
HallTelephone(10/–)	12½	12½	26/3	..	4 17 0
Henley's (5/–) ..	20	20	25/6	..	3 18 6
4½% Pref. ..	4½	4½	23/–	..	3 18 3
Hopkinsons ..	15	17½	63/9	..	5 9 9
India Rubber Pref.	5½	5½	20/–	..	5 10 0
Intl. Combustion	30	30	6½	..	4 17 10
Johnson & Phillips	15	15	70/–	..	4 5 9
LancashireDynamo	20	22½	90/–	..	5 0 0
Laurence,Scott(5/–)	15	12½	12/–	..	5 4 2
London Elec. Wire	7½	7½	31/6	..	4 15 3
Mather & Platt	10	10	50/–	..	4 0 0
Met.Elec.CablePref.	5½	5½	21/3	..	5 3 6
Murex	20	20	5½	..	3 14 6
Pye Deferred (5/–)	25	25	22/6	..	5 11 1
Revo (10/–) ..	20	17½	35/6	..	4 18 7
Reyrolle	12½	12½	67/6	..	3 14 0
Siemens Ord. ..	7½	7½	31/9	..	4 14 7
Strand Elec. (5/–)	4	7½	6/6	..	5 15 5
Switchgear & Cowans (5/–) ..	10	20	15/6	..	6 9 0
T.C.C. (10/–) ..	5	5	16/3	..	3 1 7
T.C. & M. ..	10	10	47/–	..	4 5 1
TelephoneMfg.(5/–)	9	9	12/–	..	3 15 0
Thorn Elec. (5/–)	20	20	21/–	..	4 15 5
Tube Investments	20	20	93/6	..	4 5 6
Vactric (5/–) ..	Nil	Nil	12/9	..	—
Vickers (10/–) ..	10	10	19/9	–3d.	5 1 3
WalsallConduits(4/–)	55	55	44/–xd	..	5 0 0
Ward & Goldstone (5/–)	20	20	22/6	..	4 9 0
WestinghouseBrake	10	12½	65/–	..	3 17 0
West, Allen (5/–)	7½	7½	7/–	–6d.	5 7 2

† Dividends free of Income Tax.

Stocks and Shares (*Continued from page* 764)

There is also on offer £9,000 B.C. & H. Power Station 3½ per cent. first mortgage debenture stock at 103 free of stamp and ex the interest payable on June 1st. The return is £3 7s. 9d. per cent. without taking redemption into account. Interest and sinking fund are covered by payments made by the Central Electricity Board. The sinking fund commences this year for the purchase up to, or drawings at, 100, to redeem the stock by 1963. Furthermore, the issue can be paid off at 100 after May, 1953. A similar yield is afforded by North Metropolitan Power Station 3½ per cent. second mortgage debenture Series B, March and September interest, offered at 103. The interest and sinking fund are provided by the Northmet Power Company. The stock can be redeemed at 100 after August, 1951, and the whole issue should be paid off by 1965 through the medium of a sinking fund now in operation.

Lease-Lend Results

Brazilian Traction Light & Power shares have risen to 32¾. The company continues to show substantial increases in its earnings, thus justifying the impression that the increased dividend will be maintained, or will show still further improvement in the near future. The utility companies operating in Central and South America are sharing in the prosperity of their countries due in no small measure to the working of the Lease-Lend assistance afforded to those countries by the United States. With American money pouring into Brazil, Chile, Mexico and other States, the governments of those countries are relieved from any save the moral obligation of meeting their debts. They can continue to suspend interest payments on their bonds; they can put aside the claims of sinking funds, using the money instead to buy up their depreciated issues and cancel the bonds. The lowest-ground incentive to financial honesty which is involved in the necessity for raising fresh funds is removed by the complaisance of the United States Government in its Lease-Lend policy, the indirect results of which can turn out to be as ironical as they were unexpected. The utility and commercial companies benefit by the rising prosperity of the countries. Mexican Light & Power 5 per cent. bonds are up 2½ points to 104.

NEW PATENTS

Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (1s. each) may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2.

AKT.-GES. Brown, Boveri & Cie.—"Pressure-exchangers." 14428/41. December 7th, 1940. (553208.)

Akt.-Ges. für Technische Studien.—"Thermal power plants." 3208/42. April 7th, 1941. (553218.) "Thermal power plants." 13324/41. October 18th, 1940. (553272.)

Arc Manufacturing Co., Ltd., G. Haim, and D. McAllister.—"Manufacture of metal welding rods." 14163. November 3rd, 1941. (553170.) "Manufacture of metal welding rods." 14164. November 3rd, 1941. (553171.)

H. E. Bayliss and Automatic Coil Winder & Electrical Equipment Co., Ltd.—"Holders or supports for the supply bobbins or reels of coil winding machines." 924. January 22nd, 1942. (553251.)

British Thomson-Houston Co., Ltd.—"Composite electrodes for gaseous electric discharge devices." 15339/41. November 30th, 1940. (553184.) "High-frequency electron discharge apparatus." 21/40. December 31st, 1938. (553266.) "Television synchronising systems." 11605/41. September 10th, 1940. (553302.)

British Thomson-Houston Co., Ltd., H. Trencham and J. R. Mortlock.—"Earth leakage electric protective arrangements." 3962. March 25th, 1942. (553260.)

Cinch Manufacturing Corporation.—"Sockets for thermionic valves and similar electrical devices." 15009/41. November 26th, 1940. (553280.)

Duratube & Wire, Ltd., and J. Veit.—"Flexible tubing." 13151. October 13th, 1941. (553308.)

English Electric Co., Ltd., H. S. Carnegie and W. E. M. Ayres.—"Electromagnetic slip couplings." 1204. January 28th, 1942. (Addition to 544941.) (553192.)

J. Griffiths.—"Electric battery hand torches." 4802. April 11th, 1942. (553223.)

Hazeltine Corporation.—"Vacuum tubes and method of manufacture thereof." 151/42. March 5th, 1941. (553188.)

Marconi's Wireless Telegraph Co., Ltd.—"Television transmitters." 1828/42. February 11th, 1941. (553255.)

Marconi's Wireless Telegraph Co., Ltd., and H. J. Round.—"Graving or like tools having a vibrating head." 14373. November 7th, 1941. (553176.)

S. R. Mellonie.—"Method and means for controlling the supply of electric current to individual consumers." 15168. November 25th, 1941. (553183.)

E. Mestitz and Elco (Treforest), Ltd.—"Electric soldering device." 8199. June 15th, 1942. (Addition to 547785.) (553291.) "Electrically heated device for dip-soldering and the like." 8200. June 15th, 1942. (Addition to 547785.) (553292.) "Heating elements for electric soldering devices and the like." 8201. June 15th, 1942. (553293.)

Permutit Co., Ltd., R. T. Pemberton, A. J. R. Walter and E. L. Holmes.—"Treatment of solutions by ion-exchange methods." 10166. August 11th, 1941. (553233.)

Philips Lamps, Ltd. (Naamlooze Vennootschap Philips' Gloeilampenfabrieken).—"Electric discharge tubes with deflection control." 14595. November 12th, 1941. (553181.) "Manufacture of seals between metal and glass bodies." 14889. November 19th, 1941. (553182.) "Manufacture of indirectly heated cathodes." 1097. January 26th, 1942. (553191.) "Amplitude limiters." 1624. February 6th, 1942. (553195.) "Mounting of electric contact members." 1843. February 11th, 1942. (553215.) "Discharge tubes and means for supporting and locating the electrodes thereof." 14545. November 11th, 1941. (553279.) "Magneto-electric systems." 15943. December 10th, 1941. (553282.) "Circuits for amplifying high frequency electric oscillations." 1841. February 11th, 1942. (553284.) "Circuit arrangements for electric gas discharge tubes." 11556. September 9th, 1941. (553301.)

Standard Telephones & Cables, Ltd.—"Power line telephone systems." 5886/42. April 19th, 1941. (553225.) "Multi-channel signal transmission." 8146/42. June 14th, 1941. (553290.)

Standard Telephones & Cables, Ltd. (International Standard Electric Corporation).—"Carrier current communication systems." 4066. March 27th, 1942. (553220.) "Remote indication systems." 3376. March 13th, 1942. (553286.)

Standard Telephones & Cables, Ltd., and D. R. Beckwith.—"Electric insulating material and bodies made therefrom." 11702. September 12th, 1941. (553304.)

A. H. Stevens (Electronic Laboratories, Inc.)—"Electrical systems for converting direct current into alternating current." 6874. May 20th, 1942. (553227.)

K. H. Thunell, S. D. Vigren and P. H. E. Claesson.—"Electric communication systems." 24781. August 29th, 1939. (553163.)

G. F. Travis, H. T. Ashton and Metropolitan-Vickers Electrical Co., Ltd.—"Periodic energisation of electric circuits." 14331. November 6th, 1941. (Addition to 548124.) (553206.)

R. Trist & Co., Ltd., and W. A. Chambers.—"Magnetic devices for transmitting energy." Cognate applications 10058/41 and 13817/41. August 7th, 1941. (553168.)

H. Weber.—"Electric lamp caps and bonding cements therefor." 15663. December 5th, 1941. (553247.)

Western Electric Co., Inc.—"Electromagnetic relays." 9673/42. July 17th, 1941. (553329.)

S. Wolf & Co., Ltd., and C. H. Gubbins.—"Hand or portable power operated tools." 6871. May 20th, 1942. (553325.)

Amended Specification

547365. Koehler Manufacturing Co. "Storage batteries."

CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

Contracts Open

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses.

Australia.—NEW SOUTH WALES.—Sydney County Council Electricity Department. June 24th. Steam generating plant, Pyrmont (Spec. 650).

July 8th. 50,000-kW steam turbo-alternator, Pyrmont (Spec. 651).

July 22nd. Reactor tie isolating equipment, Bunnerong (Spec. 632).

July 29th. 33-kV cables for duct lines (Spec. 628).

Orders Placed

Isle of Ely.—Health Committee. Accepted. X-ray plant (£1,332).—Watson & Sons (Electro-Medical), Ltd. Dark room equipment (£339).—Ilford, Ltd.

London. — BERMONDSEY. — Electricity Committee. Accepted. 200-kVA transformer (£224).—G.E.C. Regrinding of slip-rings and commutators of rotary convertors (£56) and supply and fixing of centrifugal blower (£22).—Burdett & Co.

METROPOLITAN WATER BOARD. Accepted. Electric lighting at Cricklewood works (£333).—Cash & Co. Transformer and circuit-breaker for Lee Bridge works (£735).—Ferranti.

JOINT ELECTRICITY AUTHORITY.—Electrical accessories.—Drake & Gorham Wholesale, Ltd. (contract extended on existing terms).

Morecambe.—Electricity Committee. Accepted. Cables for twelve months.—W. T. Glover & Co.

Northumberland.—County Council. — Accepted. Installation of electric lighting at Pegswood cooking depot (£60).—A. McLean.

Contracts in Prospect

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Banbury.—Houses (20), for R.D.C.; surveyor's offices, Castle Wharf.

Bolton.—Canteen; Bleachers' Association, Ltd., Blackfriars House, The Parsonage, Manchester 3.

Works canteen; R. H. Crook, architect, 17, Mawdsley Street.

Works canteen; George & Beddows, contractors, Valletts Lane, Bolton.

Easington.—Wartime nursery at Murton Colliery; surveyor, Council Offices, Easington, Co. Durham.

Gosport.—Building for 100 children at Brockhurst School; borough surveyor, Town Hall.

Hull.—Completion of new police station; A. Rankine, city architect, Guildhall.

Jarrow-on-Tyne.—Nursery school (£2,450); borough engineer, Town Hall.

Lancashire.—Additional classrooms at Royal Grammar School, Lancaster; L. Evans, county architect, County Offices, Preston.

London.—BERMONDSEY.—Warehouse; G. Carr & Son, Ltd.

STOKE NEWINGTON.—Additions, Matthias Road; Smith & Sons, Ltd.

ISLINGTON.—Nursery, Windsor Street (£3,102), C. & F. Bryen.

Manchester.—Extensions to bakery, Rusholme, for Smallman's, Ltd.; Martin & Rhodes, architects, 90, Deansgate.

Middlesex.—School extensions and huts (£24,885); county architect.

Newton Heath.—Additions to works and first-aid centre; Cruickshank & Seward, architects, 16 Princess St., Manchester 3.

Northumberland.—Canteen at Amble School (£1,000); county architect, County Hall, Newcastle-on-Tyne.

Northwich.—Houses (262) for rural workers for R.D.C.; J. Birtwistle, surveyor, Surveyor's Offices, Hartford, Northwich, Ches.

Orrell.—Waterworks scheme for U.D.C.; surveyor, Council Offices.

Oswestry.—Farm workers' houses at West Felton, Chirk, Gobowen, Whittington, etc., for R.D.C.; F. C. Saxon, architect, 2, Stanley Street, Chester.

Peterborough.—Substation for Town Council; A. Kefford & Sons, builders, 11, Broad Street, Whittlesey.

Rugby.—Farm workers' houses at Church Lawford for R.D.C. (£2,398); T. Bates & Son, builders, 53, Warwick Street, Coventry.

Southgate.—Restaurants at Winchmore Hill and Palmers Green; borough engineer.

Stratford-on-Avon.—Houses for R.D.C.; F. W. B. Yorke, architect, 36, Calthorpe Road, Edgbaston, Birmingham, 15.

Tenbury.—Houses at Kyre, Broadheath and Mamble for R.D.C.; Pritchard, Godwin & Clist, architects, Bank Buildings, Kidderminster.

Thedwastre.—Houses, Drinkstone and Great Ashfield, for R.D.C.; Hunt & Coates, architects, 84, Guildhall Street, Bury St. Edmunds.

Timperley.—Extensions to works, Park Road; James Smith, builder, Beechwood, Dane Road, Sale, Cheshire.

Twickenham.—Canteen, etc., Elmtree Road, for Grundy, Teddington, Ltd.; W. C. Petty & Son.

Warwickshire.—Maternity home, Stratford-on-Avon; A. C. Bunch, county architect, Shire Hall, Warwick.

Wigan.—Houses (70) for R.D.C.; J. Holding, surveyor, Bank Chambers, Wallgate, Wigan.

Wigton.—Farm workers' houses on various sites for the North-Eastern Housing Association; S. Mann, architect, 28, Lowther Street, Carlisle.